PRELIMINARY DRAINAGE REPORT

Eaglemont 4

13511 191st Avenue S.E.
Monroe, Washington

City File No. TBD

Prepared for:
Henley USA, LLC
11100 Main Street, Suite 100
Bellevue, WA 98004

June 22, 2016
Revised August 25, 2016

Our Job No. 17841

08/25/16

BARGHAUSEN CONSULTING ENGINEERS, INC.

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TABLE OF CONTENTS

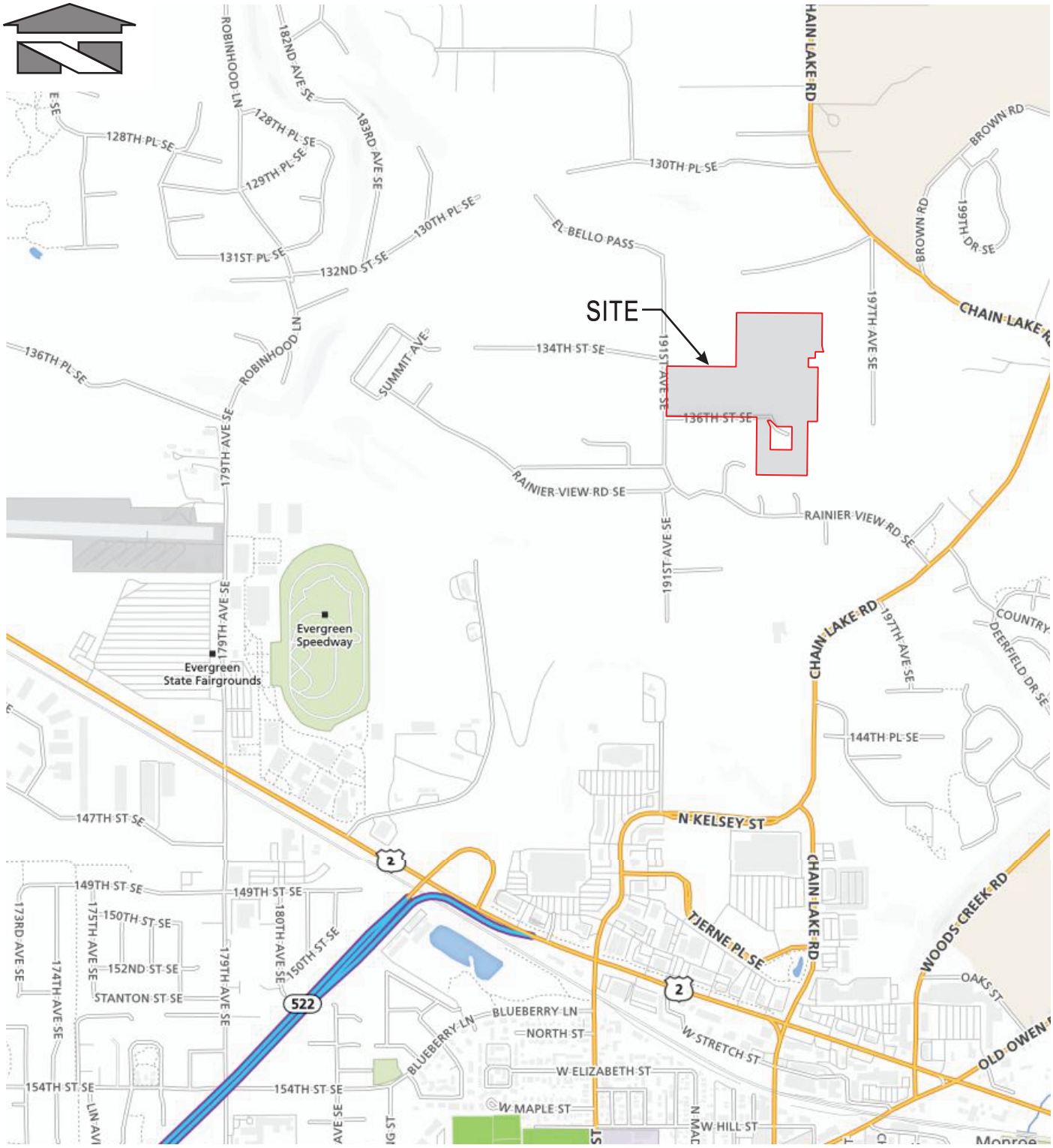
EXECUTIVE SUMMARY

The proposed plat of Eaglemont 4 will construct a subdivision of approximately 27.75 acres in size into 115 new single family residences. The proposed development is located immediately to the west of the Eaglemont Phase 1-3 subdivision in the City of Monroe. The project will clear, grade and construct roads, utility extensions, features and eventually single family residences on the lots. The project is located in the NE quarter of section 36, Township 28 North, Range 6 East, W.M. The site is specifically located at 13511 191st Ave SE. Eaglemont 4 occupies Snohomish County tax lot numbers 28063600100900, 28063600105400, 28063600102200, 28063600104100, 28063600104400, and 28063600101100. A Vicinity Map has been included; please see Figure 1 located within this section.

Most of the project site is currently undeveloped forested, with the exception of a parcel at the south end of the site, which was previously cleared and contains a single family home. The entire site lies within a single drainage basin, with the topography falling moderately to the south. Surface runoff can generally be expected to follow the existing topography, and discharge overland toward the south. Surface runoff from the developed project site will be collected and conveyed via an underground pipe network to one of the two stormwater detention ponds located along the southern boundary of the site. Water quality treatment will be provided by a StormFilter located immediately upstream of each of the detention ponds.

The USDA Soil Survey identifies the underlying soils as Tokul Gravelly Medial Loam, which is common throughout the region and is generally considered to be a glacially consolidated till. This type of soil is typically characterized as a dense ‘hardpan’ soil, with moderate runoff rates and low permeability.

Figure 1
Vicinity Map



REFERENCE: Rand McNally (2016)

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

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For:
Eaglemont 4
Monroe, WA

Title:
VICINITY MAP

Job Number
17841

DATE: 5/13/16

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Tab 1.0

SECTION 1 - PREPARATION OF STORMWATER SITE PLANS

The project is subject to the provisions of the City of Monroe's design and development standards, as well as the 2005 Stormwater Management Manual for Western Washington, issued by the Washington State Department of Ecology. This report and accompanying plans, are intended to satisfy the site plan preparation requirements outlined in the regulatory documents listed above. The DOE Stormwater Manual requires completion of the following four tasks as part of the site plan preparation process:

Task 1: Define and map the study area

The project study area includes the project site itself, as well as a tributary upstream basin, and a downstream flowpath for a distance of ¼-mile.

Task 2: Review all available information on the study area

The USDA Soil Survey identifies the underlying soils as Tokul Gravelly Medial Loam, which is common throughout the region and is generally considered to be a glacially consolidated till. This type of soil is typically characterized as a dense 'hardpan' soil, with moderate runoff rates and low permeability. For further information please see Figure 2 - Soil Survey Map provided in Appendix 1.1 of this section.

Referencing Figure 4 - FEMA Map located in Appendix 1.1 of this section of the report shows that the project site and surrounding area are not shown to be within a flood hazard area.

Task 3: Field inspect the study area

The project site and downstream flowpath were visited in April of 2015 by SDA Engineers (the engineer for the previous owner). Included within this report is the original Downstream Analysis prepared by SDA Engineers. We have reviewed their findings and concur with their analysis. At the time of the visit weather conditions were cool and cloudy, with no significant rainfall having occurred within the past 24-hours. There was no surface runoff observed near the project site, but it was observed further downstream.

The project site is directly tributary to an adjacent subdivision constructed in 2002-2003 known as Sinclair Heights. It appears that Sinclair Heights may have intended to construct a storm drainage conveyance for the Eaglemont properties. As-built drawings for Sinclair Heights are provided in Appendix 1.2 located within this section of the report, and appear to indicate the presence of an 18" ductile iron pipe through several lots of Sinclair Heights to provide a hydraulic connection between the Eaglemont property and 193rd Drive SE. The ductile iron pipe extends approximately 300-ft downstream of the project site.

The as-built plans also indicate the design of a stormwater pipe network extending through the Sinclair Heights subdivision, but the plans do not identify this network as being constructed. None of these storm features could be located during the field investigation, and they are presumed to not be installed. This pipe system would have extended an additional 425-ft downstream of the project site to an existing structure referred to as "CB 1B" on the Sinclair Heights As-built drawings (A total of 725-ft downstream of Eaglemont 4-8). This structure was located during the field inspection, and currently receives runoff from the Sinclair Heights Detention pond. The lid of this structure was removed, and runoff from the Sinclair Heights detention pond was observed passing through this structure and continuing downstream.

An 18" CPEP pipe network currently extends southwesterly from CB 1B, a distance of approximately 300ft through a wetland area toward 191st Ave SE (a total of 1,025-ft downstream of Eaglemont 4-8). This pipe outlets to a road-side ditch along the east side of 191st Ave SE which

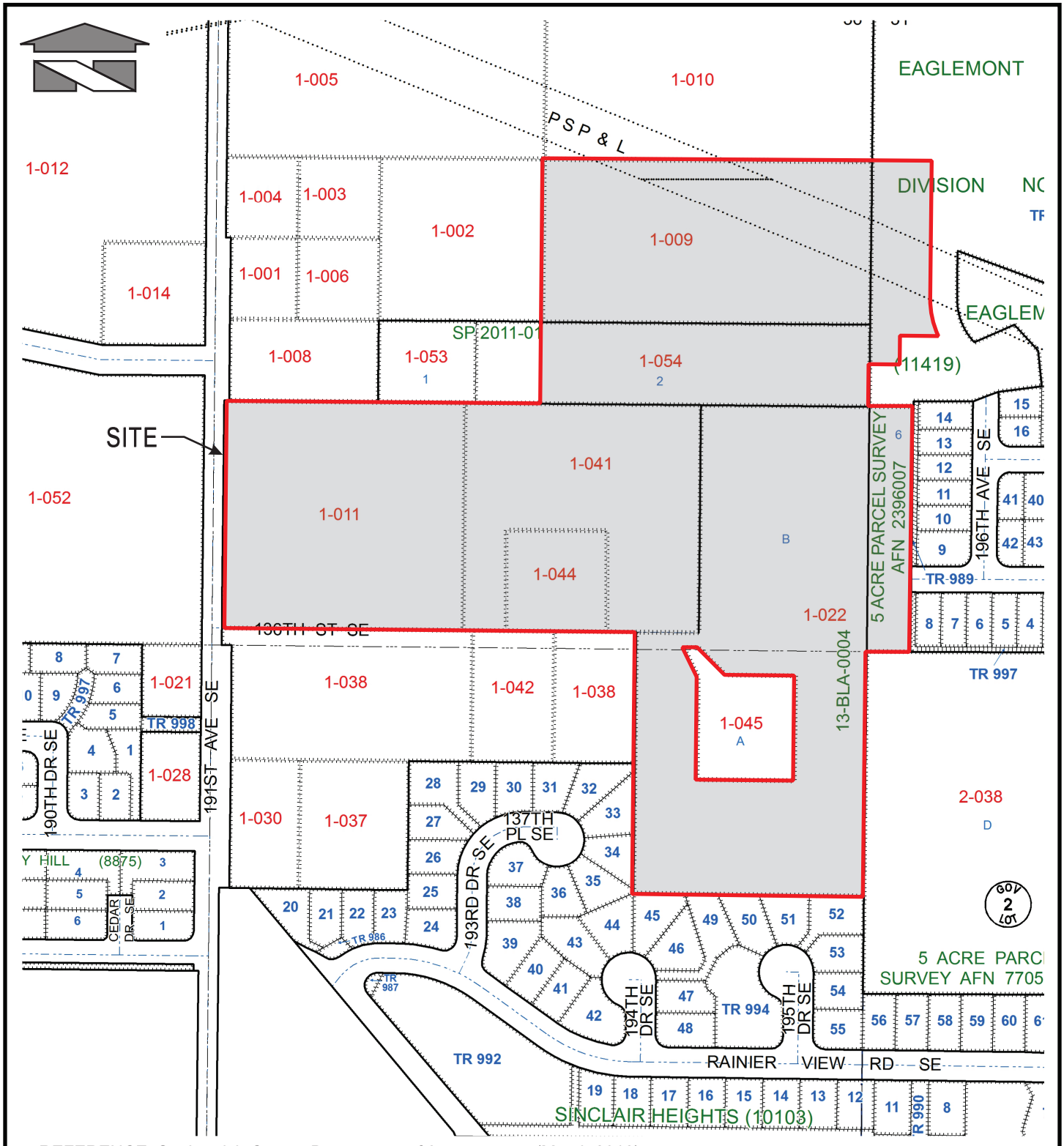
culvert which crosses westerly beneath 191st Ave (a total of 1,325-ft downstream of Eaglemont 4) This culvert discharges to an open area which appears to be a wetland area forming the headwaters of Arena Creek. This point marks the end of the ¼-mile analysis.

Task 4: Describe the drainage system, and its existing and predicted problems

As mentioned above, a portion of the intended downstream flowpath does not appear to exist, and will need to be constructed as part of the Eaglemont 4 project. The Sinclair Heights as-built drawings appear to indicate that the 18" CMP pipe which exists downstream of the Sinclair Heights detention pond needs to be removed and replaced with a 24" pipe. The capacity of this pipe system will be analyzed during the final engineering design of the project. Further downstream the flowpath extends through open drainage channels. No signs of significant erosion or sedimentation were noted through this flowpath.

Appendix 1.1
Exiting Condition Summary Documents

Figure 2
Assessor Map



REFERENCE: Snohomish County Department of Assessments (March 2016)

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

For:
Eaglemont 4
Monroe, WA

Job Number
17841

Title:
ASSESSOR MAP

DATE: 5/13/16

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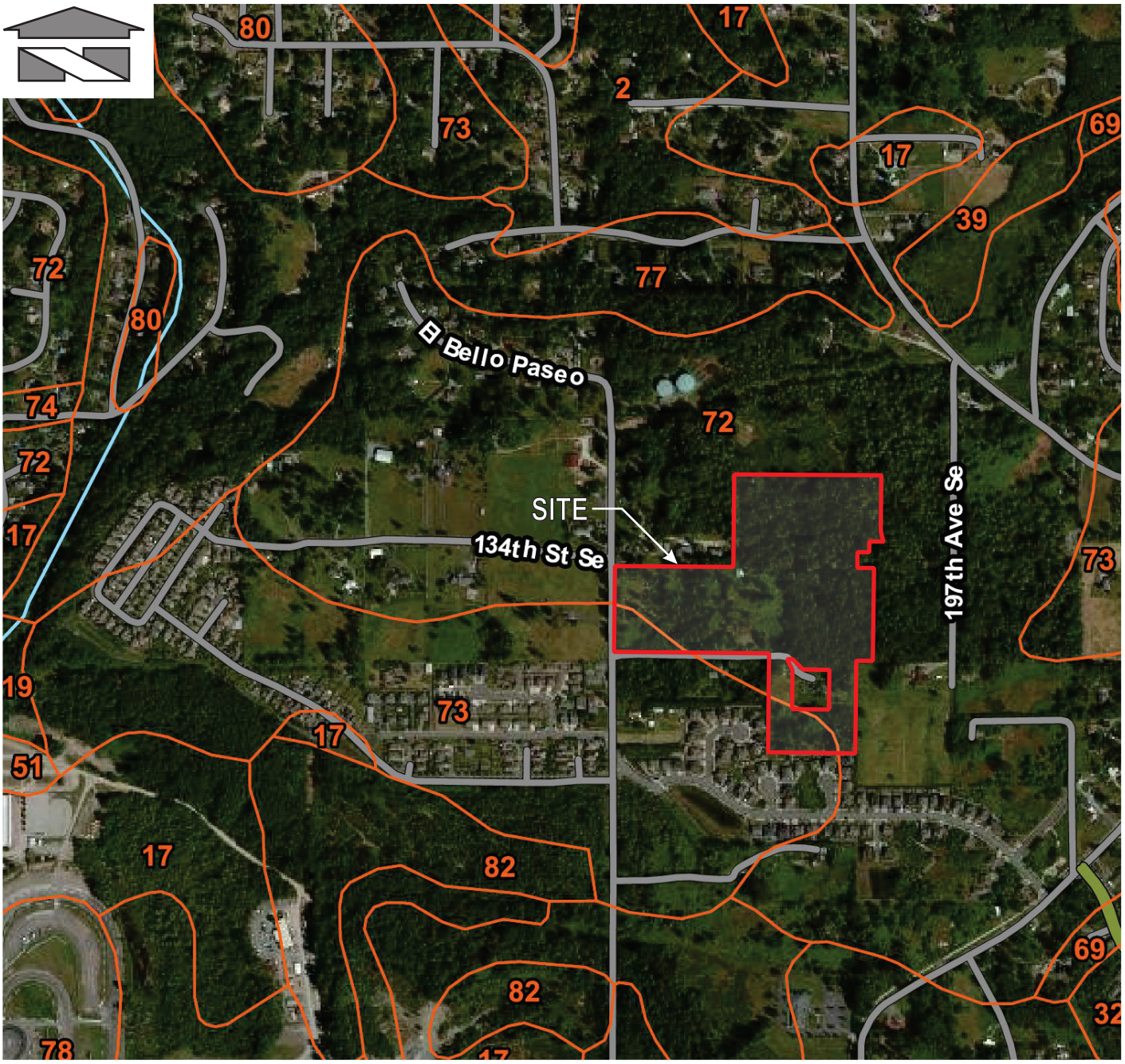
Figure 3
Soil Survey Map



REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:

72 = Tokul gravelly medial loam, 0-8% slopes
73 = Tokul gravelly medial loam, 8-15% slopes

Scale:

Horizontal: **N.T.S.** Vertical: **N/A**

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SURVEYING, ENVIRONMENTAL SERVICES

For:

Eaglemont 4
Monroe, WA

Job Number

17841

Title:

SOIL SURVEY
MAP

DATE: 5/13/16

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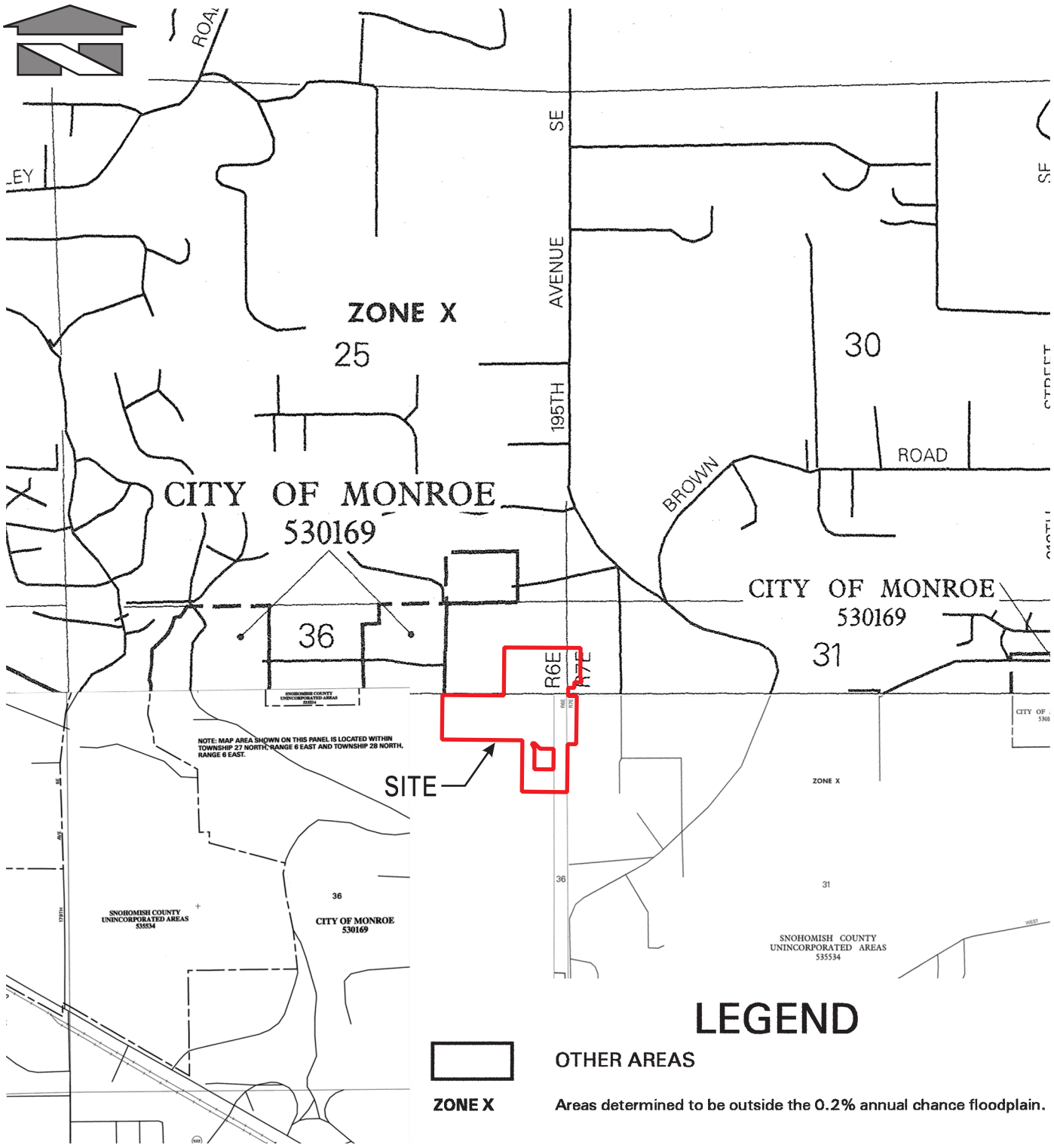
Figure 4
FEMA Map



REFERENCE: Federal Emergency Management Agency (Portion of Maps 53061C1100 E & 53061C1377 E, Nov. 1999)

Scale: Horizontal: **N.T.S.** Vertical: **N/A**	*For:* Eaglemont 4 Monroe, WA	Job Number 17841
BARGHAUSEN CONSULTING ENGINEERS, INC. 18215 72ND AVENUE SOUTH KENT, WA 98032 (425) 251-6222 (425) 251-8782 CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES	*Title:* FEMA MAP	DATE: 5/13/16

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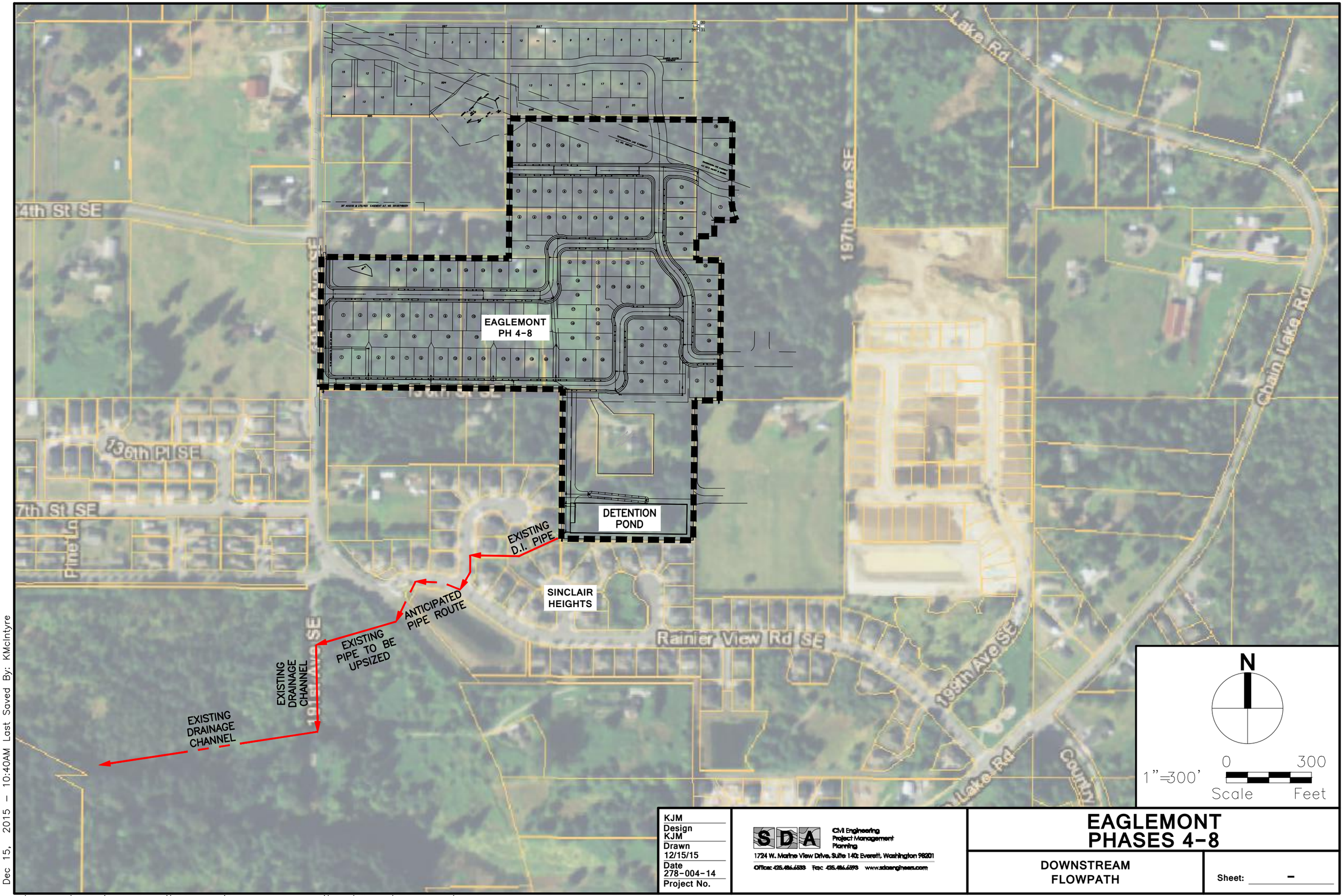
Appendix 1.2
Downstream Flowpath Analysis

APPENDIX 1.2 - DOWNSTREAM FLOWPATH ANALYSIS

Included within this section is the Downstream Analysis prepared and submitted by SDA Engineers for the original preliminary plat application. This report is on file at the City of Monroe. We have reviewed their report and concur with their findings.



Dec 15, 2015 - 10:40AM Last Saved By: KMcIntyre

KJM	
Design	KJM
Drawn	12/15/15
Date	278-004-14
Project No.	

SDA
Civil Engineering
Project Management
Planning
1724 W. Marine View Drive, Suite 140; Everett, Washington 98201
Office: 425.486.6533 Fax: 425.486.6573 www.sdaengineers.com

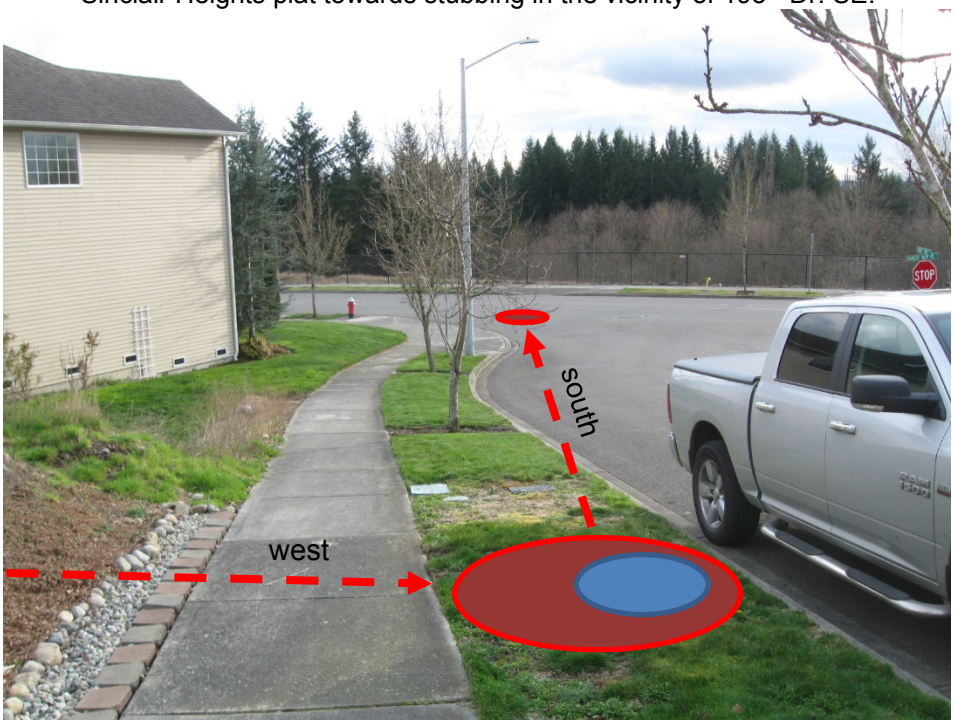
EAGLEMONT PHASES 4-8

DOWNSTREAM FLOWPATH

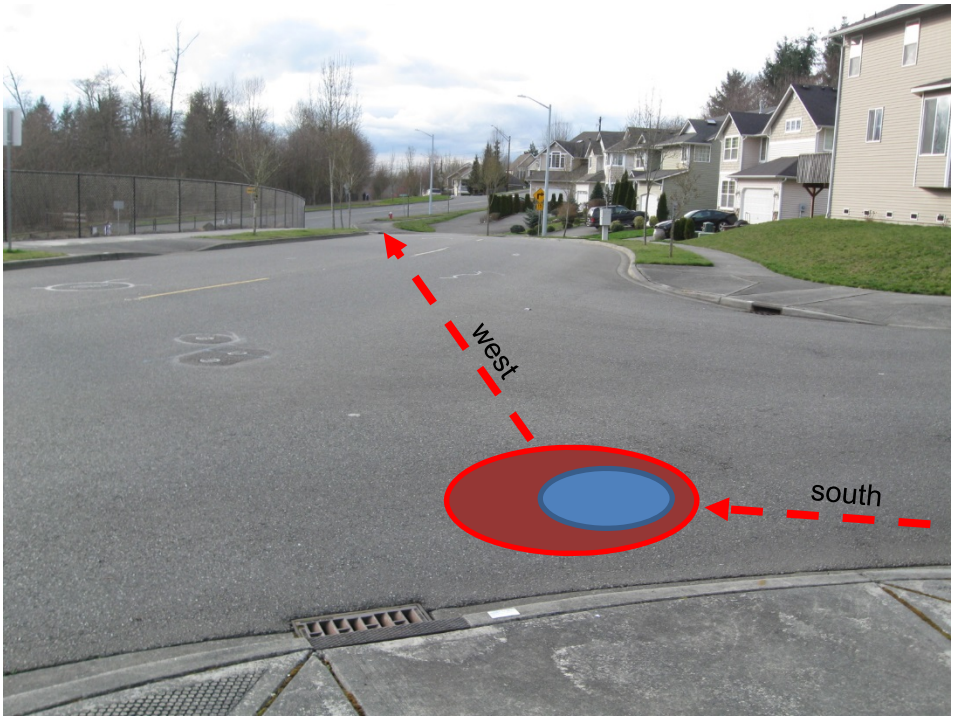
Sheet: -

R:\Projects\278 (Craig Pierce)\004-14 (Eaglemont Ph. 4-8)\Dwg\figures\TIR Figures\1B.01 - EM4-8 Downstream Figure.dwg 11x17

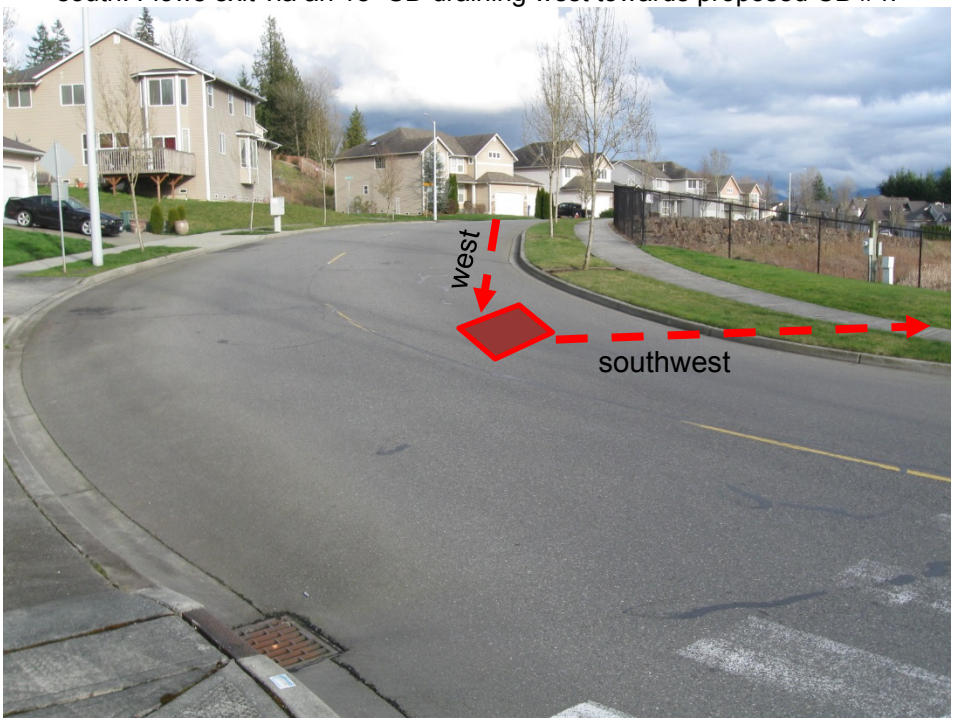
Looking east. Existing 18” ductile iron pipe stemming westward from Eaglemont Phase 5-8 into the Sinclair Heights plat towards stubbing in the vicinity of 193rd Dr. SE.



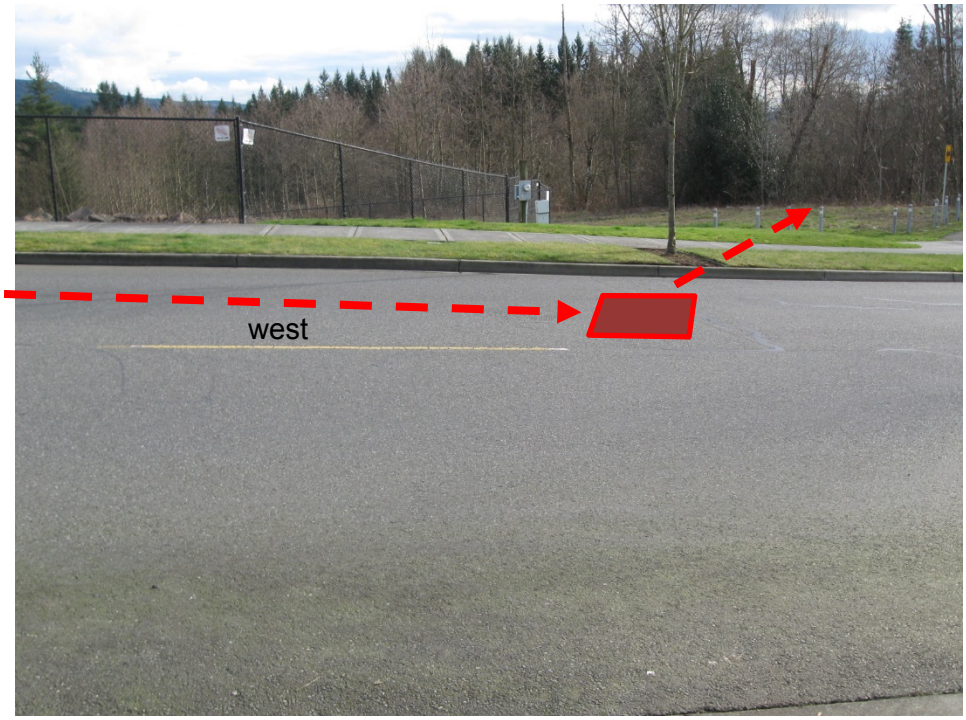
Looking south. Approximate Location of proposed CB #6 (Type 2 – 54”) with 18” inlet ductile iron draining west. Flows exit via an 18” SD draining south towards the intersection of 193rd Dr. SE and Rainier View Rd SE. Proposed stormwater infrastructure is per Sinclair Heights As-builts, attached after this photo documentation of the downstream flowpath.



Looking west. Approximate Location of proposed CB #5 (Type 2 – 48”) with 18” inlet SD draining south. Flows exit via an 18” SD draining west towards proposed CB #4.



Looking east. Approximate Location of proposed CB #4 (Type 1) with 18” inlet SD draining west. Flows exit via an 18” SD draining southwest towards ASB CB 1B (Type 2 – 48”)



Looking south west from proposed CB #4 (Type 1) with 18” inlet SD draining west. Flows exit via an 18” SD draining southwest towards ASB CB 1B (Type 2 – 48”)

Existing ASB CB 1B (Type 2 – 48”). with18” inlet SD draining southwest. Flows exit via a 24” SD draining southwest through a heavily forested WSDOT easement towards 191st Ave SE.

Flows exit on the east side of 191st Ave SE via an 18” plastic storm pipe, into an existing roadside ditch.

Flows drain south adjacent to 191st Ave SE.

Flows pass under an existing driveway within an existing 24” corrugated metal storm pipe. Flows continue draining south.

Flows drain south adjacent to 191st Ave SE.

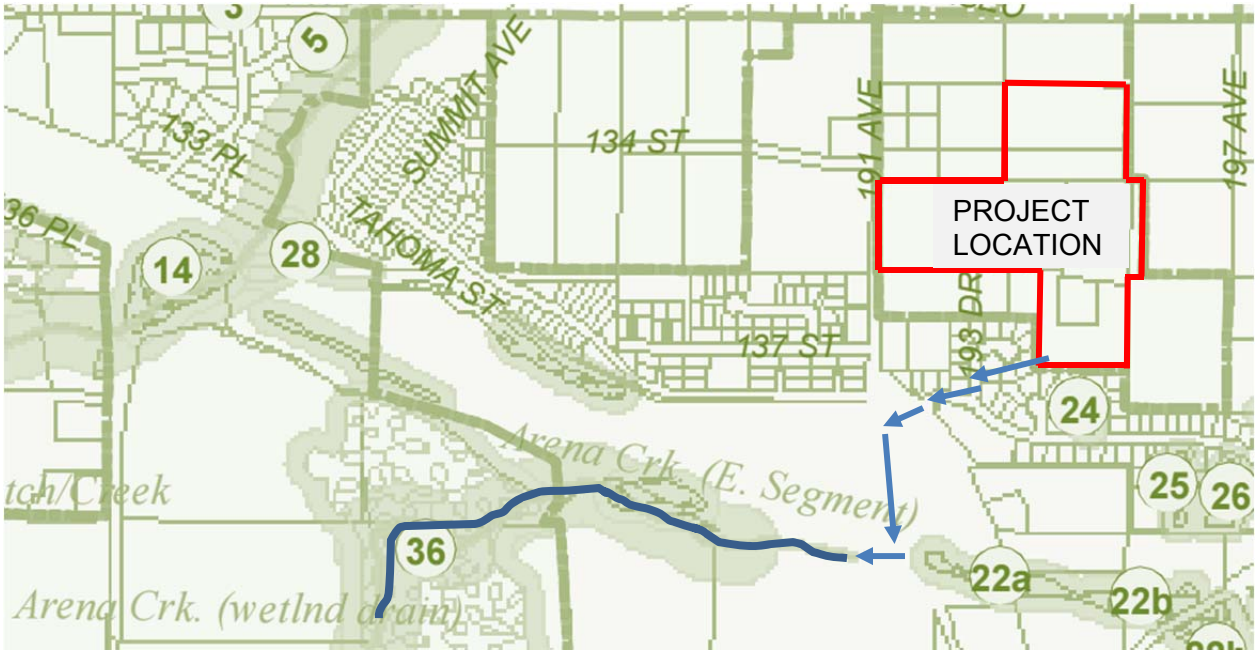
The roadside ditch flows south and drops into a deep gully on the east side of 191st Ave SE.

Site flows join another stream before entering a 24” concrete pipe that crosses west under 191st Ave SE.

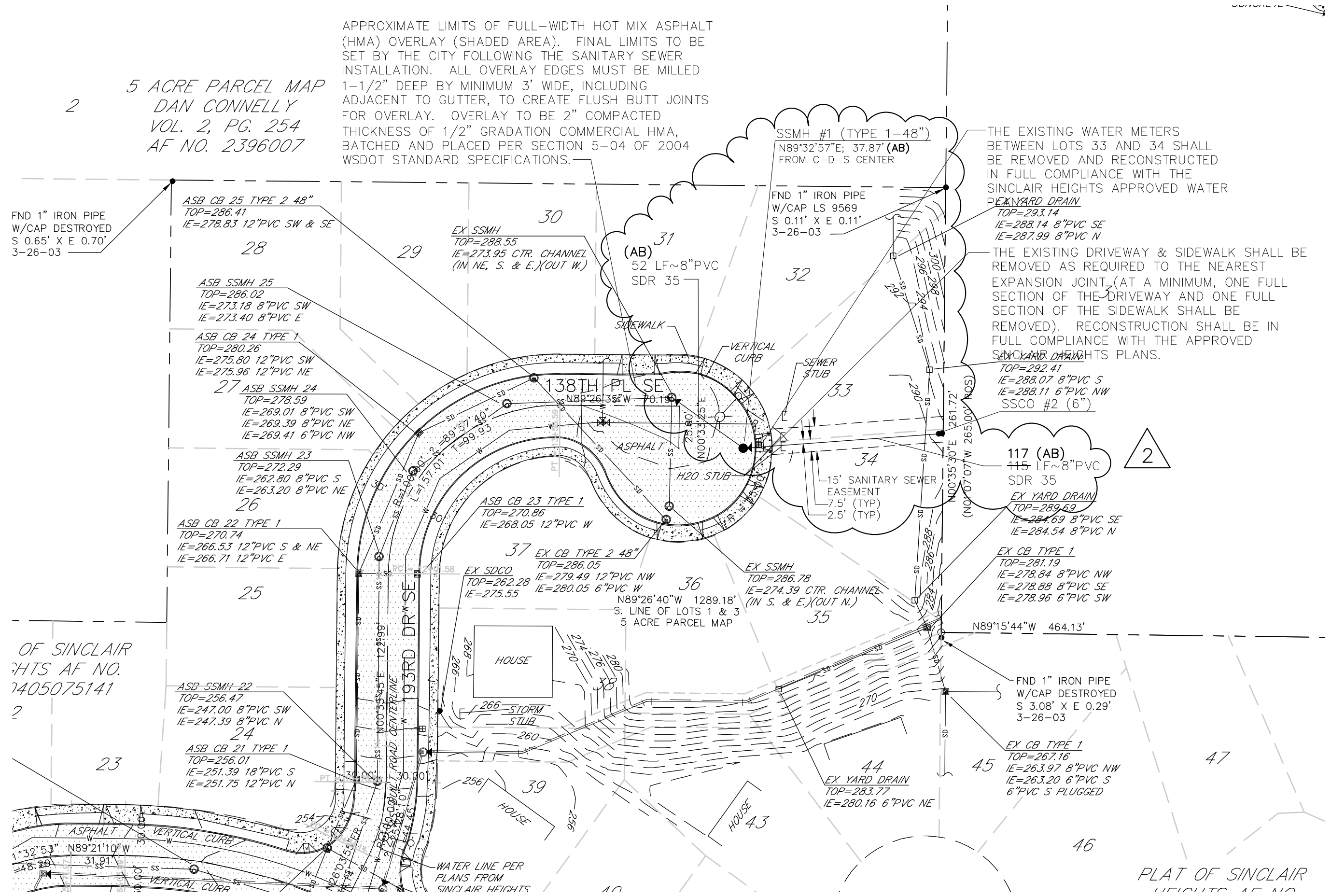
Flows exit the west side of 191st Ave SE via a 24” concrete pipe.

Flows continue draining west and begin the headwaters of Arena Creek (E. Segment) before flowing into the Arena Creek Wetland drain.

The following image is taken from the City of Monroe Critical Areas and Buffers Map, found on the City of Monroe website, and illustrates the entire downstream flow path from Project Location through Sinclair Heights, across the WSDOT proposed SR-2 property, until finally discharging into Arena Creek. Flows continue draining west flowing out of the City of Monroe limits and entering unincorporated Snohomish County.



SE1/4, NE1/4 SEC. 36 ,TWP. 28N. ,RGE. 6E. ,W.M.



SCALE 1" = 50'

50' 0 50' 100'

BASIS OF BEARINGS: W. LINE OF THE SOUTHWEST QUARTER OF SEC. 31, TWP. 28N, R. 7E, W.M. (N00°44'13"E)

DATUM: NAVD 88

BENCH: BENCHMARK IS SNOHOMISH COUNTY SURVEY CONTROL POINT NO. 1536, FOUND 1 1/2" DISC IN 4"x4" CONCRETE MONUMENT CASE IN NORTHBOUND LANE OF CHAIN LAKE ROAD APPROXIMATELY 1/4 MILE NORTH OF SR-2. ELEVATION=111.525 FEET.

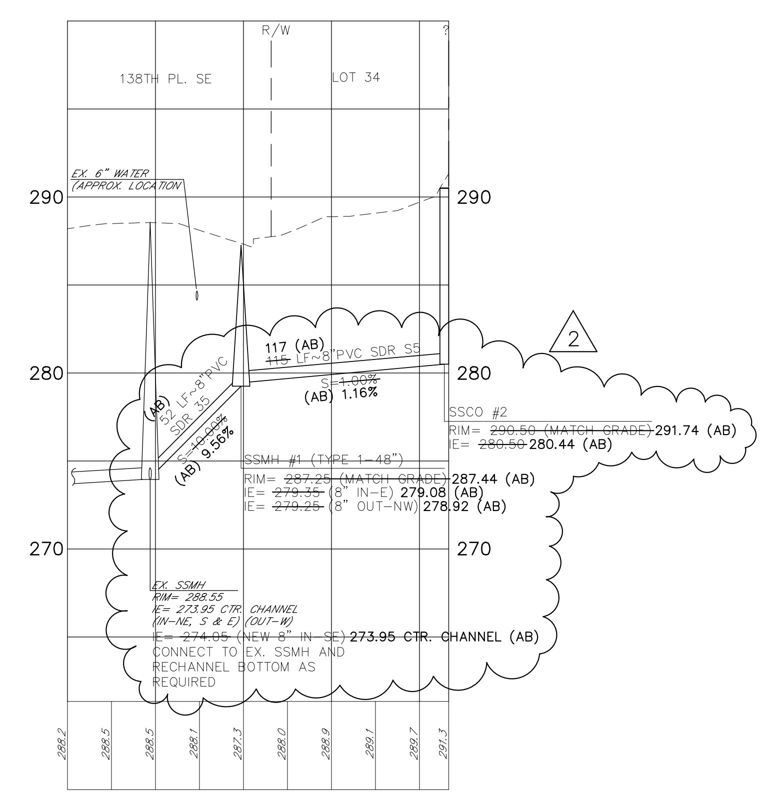
SITE BENCH: TBM 1: RAILROAD SPIKE IN POWER POLE ELEVATION=360.24'
TBM 2: RED CAPPED REBAR ELEVATION=350.08'

NOTE:

TOPOGRAPHY PROVIDED BY GROUP FOUR, INC. THIS TOPOGRAPHY HAS BEEN SUPPLEMENTED IN FRONT OF LOTS 25-30 WITH THE ROADWAY AND SIDEWALK ALIGNMENT OF 193RD DRIVE SE, AS DEPICTED ON THE DESIGN DRAWINGS FOR SINCLAIR HEIGHTS PREPARED BY BARGHAUSEN CONSULTING ENGINEERS, INC.

NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR.
2. ALL DISTURBED EXISTING IMPROVEMENTS (WATER METERS, LANDSCAPING BOLLARDS, ETC.) SHALL BE REPAIRED IN KIND TO THE SATISFACTION OF THE CITY INSPECTOR.
3. ALL ROAD RESTORATION RESULTING FROM THE PROPOSED UTILITY WORK (TRENCHING, ETC.) SHALL BE REPAIRED IN CONFORMANCE WITH CITY REQUIREMENTS.
4. TRENCHING SHALL BE IN CONFORMANCE WITH THE CITY OF MONROE PUBLIC WORKS DESIGN AND CONSTRUCTION STANDARDS 'TYPICAL TRENCH AND BEDDING SECTION', FIGURE 611. THE CDF MAY BE USED AS A SUITABLE BACHFILL MATERIAL IF THE REQUIRED 95% MAXIMUM DENSITY CANNOT BE ACHIEVED.



EX. SSMH - SSCO #2

SCALE: 1"=50' (HORIZ.)
1"= 5' (VERT.)

FINAL CORRECTED PLANS

2 AS-BUILTS BY GROUP FOUR, INC., NOVEMBER 4, 2005
(AB)= AS CONSTRUCTED

NO.	REVISION	DATE	BY
1.	REVISED PER CITY COMMENT	8/10/05	GST
2.	FINAL CORRECTED PLANS	11/4/05	GST

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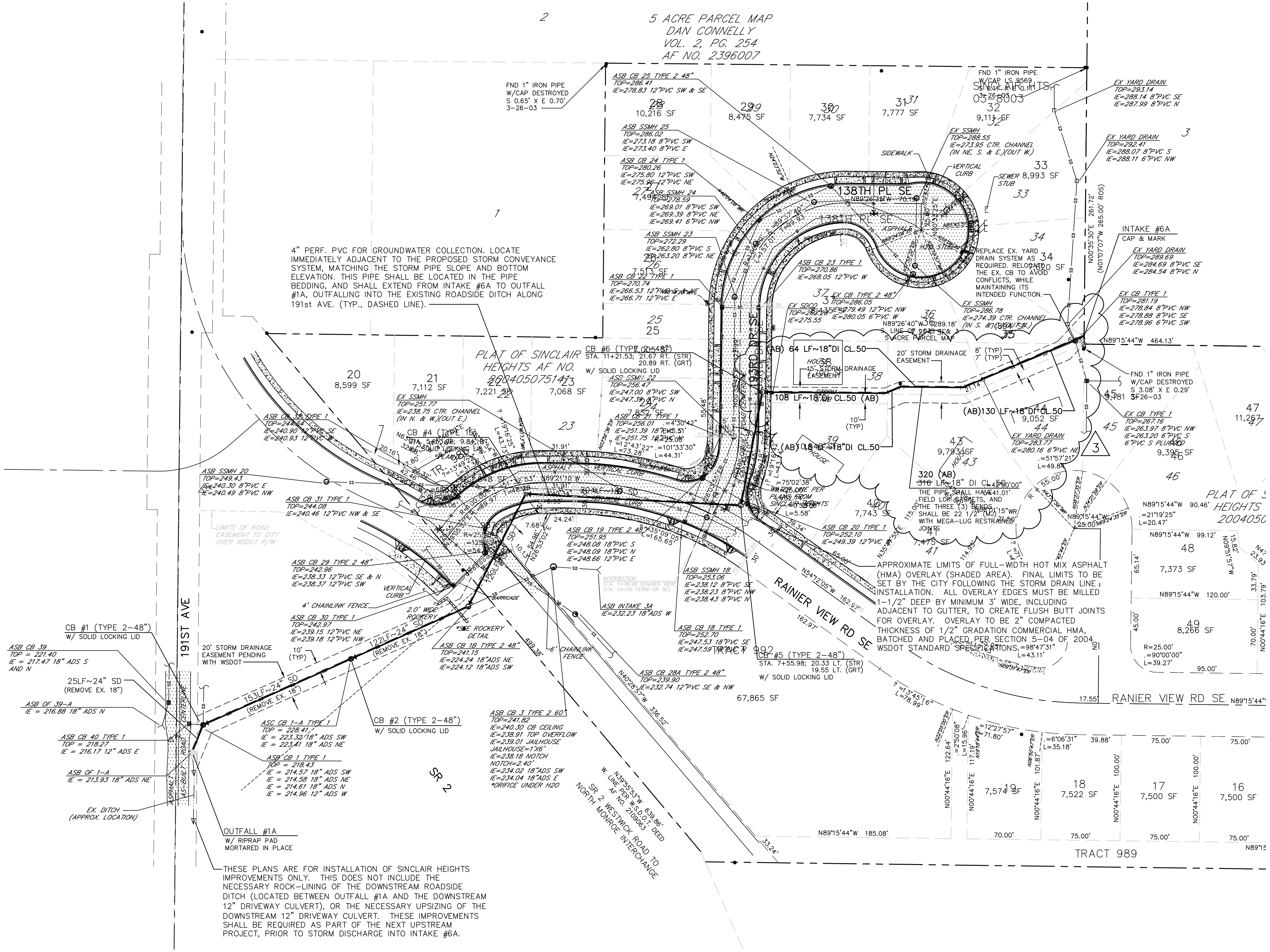
SINCLAIR HEIGHTS
FIELD CHANGE NO. 5

CITY OF MONROE WASHINGTON

SHEET	OF
3	3

03-8038



N

SCALE 1" = 50'

50' 0 50' 100'

BASIS OF BEARINGS: W. LINE OF THE SOUTHWEST QUARTER OF SEC. 31, TWP. 28N, R. 7E, W.M. (N00°44'13"E)

DATUM: NAVD 88

BENCH: BENCHMARK IS SNOHOMISH COUNTY SURVEY CONTROL POINT NO. 1536, FOUND 1 1/2" DISC IN 4"x4" CONCRETE MONUMENT CASE IN NORTHBOUND LANE OF CHAIN LAKE ROAD APPROXIMATELY 1/4 MILE NORTH OF SR-2. ELEVATION=111.525 FEET.

SITE BENCH: TBM 1: RAILROAD SPIKE IN POWER POLE
ELEVATION=360.24'
TBM 2: RED CAPPED REBAR
ELEVATION=350.08'

NOTE:

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NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR.
2. ALL DISTURBED EXISTING IMPROVEMENTS (WATER METERS, LANDSCAPING BOLLARDS, ETC.) SHALL BE REPAIRED IN KIND TO THE SATISFACTION OF THE CITY INSPECTOR.
3. PIPES LABELED AS "SD" MAY BE ANY ONE OF THE FOLLOWING MATERIALS:
   - PVC ASTM 3034, SDR 35.
   - PVC RIBBED ASTM F794.
   - HDPE HANCOR HI-Q SURE-LOK 10.8.
   - HDPE ADS N-12 WITH WATERTIGHT DOUBLE GASKETED COUPLERS.
   - REINFORCED CONCRETE PIPE WITH GASKETED JOINTS, ASTM C-76 CLASS II.
   - DUCTILE IRON (CLASS 50) REQUIRED WHEN ONE FOOT OR LESS OF COVER.
4. A RIGHT-OF-WAY DISTURBANCE PERMIT WITH A SITE SPECIFIC TRAFFIC CONTROL PLAN WILL BE REQUIRED FOR ANY WORK WITHIN THE STREET ROW. CALL JOAN COOK AT 360-863-4513 TO OBTAIN THE NECESSARY FORMS AND INFORMATION.
5. A PRECONSTRUCTION CONFERENCE WITH THE CITY INSPECTOR MUST BE HELD PRIOR TO BEGINNING CONSTRUCTION. CALL SCOTT HAWKINS AT 425-754-3757 TO SCHEDULE THE MEETING.
6. UNLESS SPECIFICALLY CALLED OUT OTHERWISE ON THESE PLANS, ALL WORK MUST CONFORM TO THE CITY OF MONROE PUBLIC WORKS DESIGN AND CONSTRUCTION STANDARDS.
7. NOTE TO CONTRACTOR: IRRIGATION LINES AND SPRINKLER HEADS EXIST IN THE GRASS STRIP BETWEEN THE CURB AND SIDEWALK. COMPLETE RESTORATION AFTER CONSTRUCTION IS REQUIRED.

3 AS-BUILTS BY GROUP FOUR, INC., NOVEMBER 4, 2005
(AB)= AS CONSTRUCTED

FINAL CORRECTED PLANS

NO.	REVISION	DATE	BY
1	REVISED PER CITY COMMENT	8/04/05	PB
2	REVISED PER CLIENT	9/14/05	PB
3.	FINAL CORRECTED PLANS	11/4/05	GST

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SINCLAIR HEIGHTS
FIELD CHANGE NO. 5

CITY OF MONROE WASHINGTON

SHEET	OF
1	3

03-8038

Appendix 1.3
Upstream Basin Analysis

Tab 2.0

SECTION 2 - STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

This section, contains a Preliminary Stormwater Pollution Prevention Plan (SWPPP), that serves the intent of explaining the 12 BMP Elements and showing which BMP's are applicable during construction. A Temporary Erosion and Sediment Control (TESC) Plan will be provided during final engineering. The SWPPP is outlined in conformance with the 2005 edition of the Washington State Department of Ecology's Stormwater Management Manual for Western Washington (DOE Manual). Please note that this SWPPP is subject to change, and will be submitted again during final engineering as a separate document.

1.0 Introduction

An introductory overview of the project has been provided in the Executive Summary of this report.

2.0 Site Description

A general site description has been provided in the Executive Summary of this report. Additional detailed information is provided through the rest of this report.

3.0 Construction Stormwater BMPs

3.1 – 12 BMP Elements

Element #1 - Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. The BMPs relevant to marking the clearing limits are identified in Appendix 2.2.

Alternate BMPs for marking clearing limits are included in Appendix 2.3 as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2.4). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

Element #2 - Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters. All wash wastewater shall be controlled on site. The specific BMPs related to establishing construction access that will be used on this project are identified in Appendix 2.2.

Alternate construction access BMPs are included in Appendix 2.3 as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2.4). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion

and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

Element #3 - Control Flow Rates

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. The specific BMPs for flow control that shall be used on this project are identified in Appendix 2.2.

Alternate flow control BMPs are included in Appendix 2.3 as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit. To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

Element #4 - Install Sediment Controls

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site or prior to being discharged to an infiltration facility. The specific BMPs to be used for controlling sediment on this project are identified in Appendix 2.2.

Alternate sediment control BMPs are included in Appendix 2.3 as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2.4). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs at the first sign that existing BMPs are ineffective or failing.

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash off of sediments from adjacent streets in runoff.

Whenever possible, sediment laden water shall be discharged into onsite, relatively level, vegetated areas (BMP C240 paragraph 4, Volume II page 116).

In some cases, sediment discharge in concentrated runoff can be controlled using permanent stormwater BMPs (e.g., infiltration swales, ponds, trenches). Sediment loads can limit the effectiveness of some permanent stormwater BMPs, such as those used for infiltration or biofiltration; however, those BMPs designed to remove solids by settling (wet ponds or detention ponds) can be used during the construction phase. When permanent stormwater BMPs will be used to control sediment discharge during construction, the structure will be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed after construction is complete and the permanent stormwater BMP will be restabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized.

Element #5 - Stabilize Soils

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project are identified in Appendix 2.2.

Seeding will be used on disturbed areas that have reached final grade or that will remain unworked for more than thirty days. Plastic Covering will be used on the temporary stock pile areas and elsewhere on the site as needed. Dust control will be implemented as needed, to prevent it being required all roadways and driveways to be paved will receive early application of gravel base.

Alternate soil stabilization BMPs are included in Appendix 2.3 as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2.4). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts. In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

Element #6 - Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion. The specific BMPs that will be used to protect slopes for this project are identified in Appendix 2.2.

Alternate slope protection BMPs are included in Appendix 2.3 as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2.4). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

Element #7 - Protect Drain Inlets

All storm drain inlets and culverts made operable during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street wash water separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and culverts that could potentially be impacted by sediment-laden runoff on and near the project site. The inlet protection measures to be applied on this project are identified in Appendix 2.2.

If the primary BMP options are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2.4), or if no BMPs are listed above but deemed necessary during construction, the Certified Erosion and Sediment Control Lead shall implement one or more of the alternative BMP inlet protection options.

Element #8 - Stabilize Channels and Outlets

Where site runoff is to be conveyed in channels, or discharged to a stream or some other natural drainage point, efforts will be taken to prevent downstream erosion. The specific BMPs for channel and outlet stabilization that shall be used on this project are identified in Appendix 2.2.

Alternate channel and outlet stabilization BMPs are included in Appendix 2.3 as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2.4). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, all temporary onsite conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected peak 10 minute velocity of flow from a Type 1A, 10-year, 24-hour recurrence interval storm for the developed condition. Alternatively, the 10-year, 1-hour peak flow rate indicated by an approved continuous runoff simulation model, increased by a factor of 1.6, shall be used. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

Element #9 - Control Pollutants

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well-organized, and free of debris. Any required BMPs to be implemented to control specific sources of pollutants are identified in Appendix 2.2.

The contractor shall implement the following measures as much as is practicable, in order to mitigate pollutant impacts from vehicles, construction equipment, and/or petroleum product storage/dispensing:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.

- On-site fueling tanks and petroleum product storage containers shall include secondary containment.

- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.

- In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.

- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

- The contractor shall implement the following concrete and grout pollution control measures.

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

The contractor shall implement the following Solid Waste pollution control measures:

- Solid waste will be stored in secure, clearly marked containers.

Element #10 - Control Dewatering

Foundation, vault, and trench de-watering water, which shall have similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system prior to discharge to a sediment trap, pond, or other specified facility. Channels must be stabilized as specified in Element #8.

Clean, non-turbid de-watering water, such as well-point groundwater, can be discharged to systems tributary to state surface waters, provided the de-watering flow does not cause erosion or flooding of receiving waters. These clean waters should not be routed through stormwater sediment ponds.

Highly turbid or contaminated dewatering water shall be handled separately from stormwater.

Element #11 - Maintain BMPs

All BMPs should be monitored and maintained regularly to ensure adequate operation. A TESC supervisor shall be identified at the beginning of the project to provide monitoring and direct the appropriate maintenance activity. As site conditions change, all BMPs shall be updated as necessary to maintain compliance with local regulations.

Temporary BMPs can be removed when they are no longer needed. All temporary erosion and sediment control BMPs shall be removed within 30 days after construction is completed and the site is stabilized.

Element #12 - Manage the Project

Erosion and sediment control BMPs for this project have been designed based on the following principles:

- Design the project to fit the existing topography, soils, and drainage patterns.

- Emphasize erosion control rather than sediment control.

- Minimize the extent and duration of the area exposed.

- Keep runoff velocities low.

- Retain sediment on site.

- Thoroughly monitor site and maintain all ESC measures.

- Schedule major earthwork during the dry season.

As this project site is located west of the Cascade Mountain Crest, the project will be managed according to the following key project components:

Phasing of Construction

- The construction project is being phased to the extent practicable in order to prevent soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.

- Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities during each phase of construction, per the Scheduling BMP (C 162).

Seasonal Work Limitations

- From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that siltladen runoff will be prevented from leaving the site through a combination of the following:

    - Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and

    - Limitations on activities and the extent of disturbed areas; and

    - Proposed erosion and sediment control measures.

- Based on the information provided and/or local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance.

- The following activities are exempt from the seasonal clearing and grading limitations:

    - Routine maintenance and necessary repair of erosion and sediment control BMPs;

    - Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and

    - Activities where there is 100 percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

Coordination with Utilities and Other Jurisdictions

- Care has been taken to coordinate with utilities, other construction projects, and the local jurisdiction in preparing this SWPPP and scheduling the construction work.

Inspection and Monitoring

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. This person has the necessary skills to:
    - Assess the site conditions and construction activities that could impact the quality of stormwater, and
    - Assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
- A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.
- Whenever inspection and/or monitoring reveals that the BMPs identified in this SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMPs or design changes shall be implemented as soon as possible.

Maintaining an Updated Construction SWPPP

- This SWPPP shall be retained on-site or within reasonable access to the site.
- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) days following the inspection.

3.2 – Site Specific BMPs

Site specific BMPs are shown on the TESC plan sheet(s) in Appendix 2A.

4.0 Construction Phasing and BMP Implementation

The BMP implementation schedule will be driven by the construction schedule. The list below provides an estimate of the anticipated construction schedule. The project site is located west of the Cascade Mountain Crest. As such, the dry season is considered to be from May 1 to September 30, and the wet season is considered to be from October 1 to April 30.

5.0 Pollution Prevention Team

5.1 – Roles and Responsibilities

The pollution prevention team consists of personnel responsible for implementation of the SWPPP, including the following:

- Certified Erosion and Sediment Control Lead (CESCL) – primary contractor contact, responsible for site inspections (BMPs, visual monitoring, sampling, etc.); to be called upon in case of failure of any ESC measures.

- Resident Engineer – For projects with engineered structures only (sediment ponds/traps, sand filters, etc.): Site representative for the owner that is the project's supervising engineer responsible for inspections and issuing instructions and drawings to the contractor's site supervisor or representative.

- Emergency Ecology Contact – Individual to be contacted at Ecology in case of emergency.

- Emergency Owner Contact – Individual that is the site owner or representative of the site owner to be contacted in the case of an emergency.

- Non-Emergency Ecology Contact – Individual that is the site owner or representative of the site owner that can be contacted if required.

- Monitoring Personnel – Personnel responsible for conducting water quality monitoring; for most sites this person is also the CESCL.

5.2 – Team Members

Names and contact information for those identified as members of the pollution prevention team are provided in the project summary in Appendix 2.2.

6.0 Site Inspections and Monitoring

Monitoring includes visual inspection, monitoring for water quality parameters of concern, and documentation of the inspection and monitoring findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;

- Site inspections; and,

- Stormwater quality monitoring.

For convenience, the inspection forma and water quality monitoring forms included in Appendix 2.5 of this report include the required information for the site log book. This SWPPP may function as the site log book, if desired, or the forms may be separated and included in a separate site log book. However, if separated, the site log book must be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.1 – Site Inspection

All BMPs will be inspected, maintained, and repaired as needed to assure continued performance of their intended function. The inspector will be a Certified Erosion and Sediment Control Lead (CESCL) per BMP C160. The name and contact information for the CESCL is provided in Section 5 of this SWPPP.

Site inspection will occur in all areas disturbed by construction activities and at all stormwater discharge points. Stormwater will be examined for the presence of suspended sediment, turbidity, discoloration, and oily sheen. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair

or replace any of the BMPs to improve the quality of stormwater discharges. All maintenance and repairs will be documented in the site log book or forms provided in this document. All new BMPs or design changes will be documented in the SWPPP as soon as possible.

6.1.1 Site Inspection Frequency

Site inspections will be conducted at least once a week and within 24 hours following any rainfall event which causes a discharge of stormwater from the site. For sites with temporary stabilization measures, the site inspection frequency can be reduced to once every month.

6.1.2 Site Inspection Documentation

The site inspector will record each site inspection using the site log inspection forms provided in Appendix 2.5. The site inspection log forms may be separated from this SWPPP document, but will be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.2 – Stormwater Quality Monitoring

6.2.1 Turbidity Sampling

Monitoring requirements for the proposed project will include turbidity sampling to monitor site discharges for water quality compliance with the 2010 Snohomish County Drainage manual and Snohomish County Code Title 30.63A NPDES Construction Stormwater General Permit (Appendix 2.4). Sampling will be conducted at all site discharge points at least once per calendar week.

Turbidity monitoring will follow the analytical methodologies described in Section S4 of the 2005 Construction Stormwater General Permit (Appendix 2.4). The key benchmark values that require action include 25 NTU and 250 NTU for turbidity. If the 25 NTU benchmark for turbidity is exceeded, the following steps will be conducted:

1. Ensure all BMPs specified in this SWPPP are installed and functioning as intended.

2. Assess whether additional BMPs should be implemented and make revisions to the SWPPP as necessary.

3. Sample the discharge location daily until the analysis results are less than 25 NTU (turbidity) or 32 cm (transparency).

If the turbidity is greater than 25 NTU but less than 250 NTU for more than 3 days, additional treatment BMPs will be implemented within 24 hours of the third consecutive sample that exceeded the benchmark value. Additional treatment BMPs will include, but are not limited to, off-site treatment, infiltration, filtration and chemical treatment.

If the 250 NTU benchmark for turbidity is exceeded at any time, the following steps will be conducted:

1. Notify Ecology by phone within 24 hours of analysis.

2. Continue daily sampling until the turbidity is less than 25 NTU.

3. Initiate additional treatment BMPs such as off-site treatment, infiltration, filtration and chemical treatment within 24 hours of the first 250 NTU exceedance.

4. Implement additional treatment BMPs as soon as possible, but within 7 days of the first 250 NTU exceedance.

5. Describe inspection results and remedial actions that are taken in the site log book and in monthly discharge monitoring reports.

6.2.2 pH Sampling

Stormwater runoff will be monitored for pH starting on the first day of any activity that includes more than 40 yards of poured or recycled concrete, or after the application of "Engineered Soils" such as, Portland cement treated base, cement kiln dust, or fly ash. This does not include fertilizers. For concrete work, pH monitoring will start the first day concrete is poured and continue until 3 weeks after the last pour. For engineered soils, the pH monitoring period begins when engineered soils are first exposed to precipitation and continue until the area is fully stabilized.

Stormwater samples will be collected daily from all points of discharge from the site and measured for pH using a calibrated pH meter, pH test kit, or wide range pH indicator paper. If the measured pH is 8.5 or greater, the following steps will be conducted:

1. Prevent the high pH water from entering storm drains or surface water.

2. Adjust or neutralize the high pH water if necessary using appropriate technology such as CO2 sparging (liquid or dry ice).

3. Contact Ecology if chemical treatment other than CO2 sparging is planned.

7.0 Reporting and Recordkeeping

7.1 – Recordkeeping

7.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in Appendix 2.5 of this report include the required information for the site log book.

7.1.2 Records Retention

Records of all monitoring information (site log book, inspection reports/checklists, etc.), this Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements will be retained during the life of the construction project and for a minimum of three years following the termination of permit coverage in accordance with permit condition S5.C.

7.1.3 Access to Plans and Records

The SWPPP, General Permit, Notice of Authorization letter, and Site Log Book will be retained on site or within reasonable access to the site and will be made immediately available upon request to Ecology or the local jurisdiction. A copy of this SWPPP will be provided to Ecology within 14 days of receipt of a written request for the SWPPP from Ecology. Any other information requested by Ecology will be submitted within a reasonable time. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with permit condition S5.G.

7.1.4 Updating the SWPPP

In accordance with Conditions S3, S4.B, and S9.B.3 of the General Permit, this SWPPP will be modified if the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site or there has been a change in design, construction, operation, or maintenance at the site that has a significant effect on the discharge, or potential for discharge, of pollutants to the waters of the State. The SWPPP will be modified within seven days of determination based on inspection(s) that additional or modified BMPs are necessary to correct problems identified, and an updated timeline for BMP implementation will be prepared.

7.2 – Reporting

7.2.1 Discharge Monitoring Reports

Discharge Monitoring Report (DMR) forms will not be submitted to Ecology because water quality sampling is not being conducted at the site.

7.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit are not met, and it causes a threat to human health of the environment, the following steps will be taken in accordance with permit section S5.F:

1. Ecology will be immediately notified of the failure to comply.

2. Immediate action will be taken to control the noncompliance issue and to correct the problem. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.

3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

In accordance with permit condition S2.A, a complete application form will be submitted to Ecology and the appropriate local jurisdiction (if applicable) to be covered by the General Permit.

Appendix 2.1
Site Plan with BMP Measures

APPENDIX 2.1 - SITE PLAN WITH BMP MEASURES

The Site Plan is to be included during final engineering design.

Appendix 2.2
SWPPP Project Summary

PROJECT TEAM MEMBERS:

Title	Name(s)	Phone Number
Certified Erosion & Sediment Control Lead	To be determined	
Resident Engineer	Barry Talkington	(425) 251-6222
Emergency Ecology Contact	Puget Sound Office	(425) 649-7000
Emergency Owner Contact	To be determined	
Non-Emergency Ecology Contact	Northwest Region	(425) 649-7000
Monitoring Personnel	To be determined	

ESTIMATED CONSTRUCTION SCHEDULE:

- Construction Start Date — April 2017
- Install ESC Measures — April 2017
- Construction End Date — October 2018

CONSTRUCTION BMP LIST:

- High Visibility Plastic or Metal Fence (BMP C103)
- Silt Fence (BMP C233)
- Storm Drain Inlet Protection (BMP C220)
- Materials on Hand (BMP C150) may also be applicable
- Detention Pond Or Vault
- Temporary and Permanent Seeding (BMP C120)
- Plastic Covering (BMP C123)
- Topsoiling (BMP C125)
- Dust Control (BMP C140)
- Early application of gravel base on areas to be paved
- Temporary and Permanent Seeding (BMP C120)
- Interceptor Dike and Swale (BMP C200)
- Check Dams (BMP C207)
- Grass-Lined Channels (BMP C201)
- Check Dams (BMP C207)
- Straw Wattles (BMP C235)

Appendix 2.3
Alternate BMPs

APPENDIX 2.3 - ALTERNATIVE BMPS

The following includes a list of possible alternative BMPs for each of the 12 elements not described in the main SWPPP text. This list can be referenced in the event a BMP for a specific element is not functioning as designed and an alternative BMP needs to be implemented.

Element #1 - Mark Clearing Limits

- High Visibility Plastic or Metal Fence (BMP C103)

Element #2 - Establish Construction Access

- Wheel Wash (BMP C106)

Element #3 - Control Flow Rates

- (none)

Element #4 - Install Sediment Controls

- Straw Bale Barrier (BMP C230)
- Vegetated Strip (BMP C234)
- Materials on Hand (BMP C150)

Element #5 - Stabilize Soils

- Dust Control (BMP C140)
- Topsoiling (BMP C125)
- Sodding (BMP C124)

Element #6 - Protect Slopes

- Straw Wattles (BMP C235)
- Grass-Lined Channels (BMP C201)

Element #7 - Protect Drain Inlets

- (none)

Element #8 - Stabilize Channels and Outlets

- Level Spreader (BMP C206)

Element #9 - Stabilize Channels and Outlets

- (none)

Element #10 - Control Dewatering

- (none)

Appendix 2.4
General Permit

APPENDIX 2.4 - GENERAL PERMIT

A copy of the Construction Stormwater General Permit will be included once it is obtained.

Appendix 2.5
Site Lot & Inspection Form

Site Inspection Forms (and Site Log)

The results of each inspection shall be summarized in an inspection report or checklist that is entered into or attached to the site log book. It is suggested that the inspection report or checklist be included in this appendix to keep monitoring and inspection information in one document, but this is optional. However, it is mandatory that this SWPPP and the site inspection forms be kept onsite at all times during construction, and that inspections be performed and documented as outlined below.

At a minimum, each inspection report or checklist shall include:

a. Inspection date/times

b. Weather information: general conditions during inspection, approximate amount of precipitation since the last inspection, and approximate amount of precipitation within the last 24 hours.

c. A summary or list of all BMPs that have been implemented, including observations of all erosion/sediment control structures or practices.

d. The following shall be noted:

   i. Locations of BMPs inspected,
   ii. Locations of BMPs that need maintenance,
   iii. The reason maintenance is needed
   iv. Locations of BMPs that failed to operate as designed or intended, and
   v. Locations where additional or different BMPs are needed, and the reason(s) why.

e. A description of stormwater discharged from the site. The presence of suspended sediment, turbid water, discoloration, and/or oil sheen shall be noted, as applicable.

f. A description of any water quality monitoring performed during inspection, and the results of that monitoring.

g. General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.

h. A statement that, in the judgment of the person conducting the site inspection, the site is either in compliance or out of compliance with the terms and conditions of the SWPPP and the NPDES permit. If the site inspection indicates that the site is out of compliance, the inspection report shall include a summary of the remedial actions required to bring the site back into compliance, as well as a schedule of implementation.

i. Name, title, and signature of person conducting the site inspection; and the following statement: "I certify under penalty of law that this report is true, accurate, and complete, to the best of my knowledge and belief".

When the site inspection indicates that the site is not in compliance with any terms and conditions of the NPDES permit, the Permittee shall take immediate action(s) to: stop, contain, and clean up the unauthorized discharges, or otherwise stop the noncompliance; correct the problem(s); implement appropriate Best Management Practices (BMPs), and/or conduct maintenance of existing BMPs; and achieve compliance with all applicable standards and permit conditions. In addition, if the noncompliance causes a threat to human health or the environment, the Permittee shall comply with the Noncompliance Notification requirements in Special Condition S5.F of the permit.

Site Inspection Form

General Information

Project Name:
Inspector Name: **Title:**
CESCL # :
Date: **Time:**
Inspection Type: □ After a rain event
□ Weekly
□ Turbidity/transparency benchmark exceedance
□ Other
Weather
Precipitation Since last inspection In last 24 hours
Description of General Site Conditions:

Inspection of BMPs

Element 1: Mark Clearing Limits

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 2: Establish Construction Access

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 3: Control Flowrates

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 4: Install Sediment Controls

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 5: Stabilize Soils

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 6: Protect Slopes

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 7: Protect Drain Inlets

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 8: Stabilize Channels and Outlets

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 9: Control Pollutants

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 10: Control Dewatering

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Stormwater Discharges From the Site		Observed?				Problem/Corrective Action
		Y	N			
Location						
	Turbidity					
	Discoloration					
	Sheen					
Location						
	Turbidity					
	Discoloration					
	Sheen					

Water Quality Monitoring
Was any water quality monitoring conducted? ☐ Yes ☐ No If water quality monitoring was conducted, record results here:
If water quality monitoring indicated turbidity 250 NTU or greater; or transparency 6 cm or less, was Ecology notified by phone within 24 hrs? ___ _____ _____ ☐ Yes ☐ No
If Ecology was notified, indicate the date, time, contact name and phone number below: Date: Time: Contact Name: Phone #:
General Comments and Notes Include BMP repairs, maintenance, or installations made as a result of the inspection.
Were Photos Taken? ☐ Yes ☐ No If photos taken, describe photos below:

Appendix 2.6
TESC Calculations

APPENDIX 2.6 - TESC CALCULATIONS

Calculations will be included during final engineering design.

Tab 3.0

SECTION 3 - SOURCE CONTROL OF POLLUTION

The project is not classified as a high-use site, and no hazardous materials requiring source control BMPs are proposed to be stored on-site.

Tab 4.0

SECTION 4 - PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

The existing site topography falls moderately to the south, and surface runoff can generally be expected to follow this existing ground topography, flowing overland and discharging across the southern boundary toward the Sinclair Heights subdivision. The project proposes to collect surface runoff and provide flow control via two hydraulically separate ponds located at the south end of the project. Runoff will discharge from this facility to a pipe installed within Sinclair Heights specifically for the anticipated development of this project. This is intended to maintain the existing flow patterns in the area.

Tab 5.0

SECTION 5 - ON-SITE STORMWATER MANAGEMENT

Existing Site Hydrology

The project site occupies a single drainage basin, approximately 28.15 acres in size. Runoff generally flows to the south. The existing site is mostly unoccupied and undeveloped, except for a single residence near the southern edge of the project. This existing residence will be maintained, the lot area is approximately 1.01 acres in size. For the purpose of avoiding the dam safety threshold the existing sites drainage basin will be dived into two separate developed basins each to be detained by its own hydraulically separate detention pond. The breakdown of each existing predeveloped basin is as follows.

Predeveloped Basin 1 is 12.11 acres in size and has been modeled as fully forested. Predeveloped Basin 2 is 16.04 acres in size, and contains an existing single family residence that is to remain. Using aerial photographs there is approximately 0.20 Acres of impervious surface associated with the existing residence that will be accounted for in the Predeveloped Basin, the remaining 0.81 acres appear to be lawn. The remaining 15.03 acres of the Predeveloped Basin 2 is to be modeled as fully forested.

There is an Upstream Basin, located just north of the wetland located in the northeastern corner of the site, which cannot be bypassed around the site and will be accounted for in the developed condition. The basin is approximately 5.46 acres in size with 1.16 acres of impervious surface, which was determined from an aerial photograph. The remaining 4.30 acres of Upstream Basin will be molded as lawn. The Plat of Sky View Ridge, designed by Joseph M. Smeby of Omega Engineers, located to the immediate north of the project site, has been recently approved and will be developed or in the process of, by the time construction for this project begins. The Detention Pond for Sky View Ridge discharges to a level spreader located in the southeast corner of the upstream basin. The upstream basin and discharged runoff from Sky View Ridge will be routed to the south detention pond that is to accommodate Predeveloped Basin 1. For further information please reference Figure - 5 Predeveloped Basin Map, located within Appendix 5.1 of this section.

Developed Site Hydrology

The completed Eaglemont 4 project will create 115 new single family residences. New impervious surfaces will include roadways, driveways, and roof areas. The project will be providing landscaped pervious areas, open space/park areas, and a single drainage facility serving the majority of the development.

A conveyance system consisting of catch basins and storm pipes will be constructed in the roadways to collect drainage from impervious surfaces and lots, and will be routed to one of the two new drainage facilities within Tract 999, located along the southernmost boundary of the site.

It should be noted that there is a small portion of the site in the northeast corner that will be routed to Eaglemont Phase 1-3 for both water quality treatment and detention. This area includes lots 13-16, Tract 996 and a small portion of right of way. This area is not considered to be bypass due to the fact that the existing stormwater facilities for Eaglemont Phase 1-3 had been sized to include this region of the Eaglemont 4 development; per the drainage report prepared by SDA engineers for Eaglemont Phase 1-3.

Waterquality for the project will be provided by a StormFilter vault immediately upstream of the detention ponds. For further information on the StormFilter and its sizing please reference Section 6 - Runoff Treatment of this report.

The detention ponds within Tract 999 has been sized using WWHM2012 stormwater program. Discharges are designed to match developed discharge durations to pre-developed durations for

hydrology. Each of the two detention ponds and its associated conveyance system has been designed to preform hydraulically separate from one another.

Detention Pond 1 will be sized to accommodate the runoff from an upstream basin that cannot be routed around the drainage facilities. The upstream basin is approximately 0.78 acres in size with 0.37 acres of impervious surface, which was determined from an aerial photograph. The remaining 0.41 acres of Upstream Basin will be molded as lawn.

The upstream basin tributary to the detention pond can be broken down as follows:

Impervious	Pervious	Total Area
0.37 Ac(1)	0.41 Ac(2)	0.78 Ac

Notes:

1. Rooftop and Paved Areas = 0.37 Ac
2. Modeled as till grass.

Additionally Detention Pond 1 has been sized to accommodate roughly half of the proposed impervious surface from the new roads and lot areas to be. Newly constructed lots areas were assumed to be 60 percent impervious, and new right of way area is assumed to be 90 percent impervious. The developed drainage basin tributary to the detention pond can be broken down as follows:

Impervious	Pervious	Total Area
7.98 Ac(1)	4.13 Ac(2)	12.11 Ac

Notes:

1. Roads and Sidewalks (90% of ROW) = 2.45 Ac
   Lot Area @ 60% impervious = 4.88 Ac
   Pond = 0.65 Ac
2. Modeled as till grass.

In essence the total area tributary to Detention Pond 1 is 12.89 acres with a total impervious area of 8.35 acres and 4.54 of pervious till grass. Please reference Figure - 6 Developed Basin Map, located within Appendix 5.1 of this section for further detail. For the Detention Pond Design and sizing calculations please refer to Section 7 - Flow Control of this report.

Detention Pond 2 has been sized to accommodate the remaining proposed impervious surface from the new roads and lot areas to be constructed as well as the existing impervious from the household to remain. Newly constructed lots areas were assumed to be 60 percent impervious, and new right of way area is assumed to be 90 percent impervious. The developed drainage basin tributary to the detention pond can be broken down as follows:

Impervious	Pervious	Total Area
7.75 Ac(1)	8.29 Ac(2)	16.04 Ac

Notes:

1. Roads and Sidewalks (90% of ROW) = 2.74 Ac
   Lot Area @ 60% impervious = 4.16 Ac

Pond = 0.65 Ac
Impervious on Existing Lot to Remain = 0.20 Ac

2. Modeled as till grass.

The total area tributary to Detention Pond 2 is 16.04 acres with a total impervious area of 7.75 acres and 8.29 of pervious till grass. Please reference Figure - 6 Developed Basin Map, located within Appendix 5.1 of this section for further detail. For the Detention Pond Design and sizing calculations please refer to Section 7 - Flow Control of this report.

Performance Standards

The project is subject to the provisions of the City of Monroe's design and development standards, as well as the 2005 Stormwater Management Manual for Western Washington, issued by the Washington State Department of Ecology. This report, along with the accompanying plans, are intended to satisfy the site plan preparation requirements outlined in the regulatory documents listed above.

Hydrologic modeling was performed using the 2012 Western Washington Hydrology Model hence forth referred to as WWHM2012. WWHM2012 is a locally calibrated continuous simulation model developed by the Washington State Department of Ecology. The model evaluates several decades of hydrologic data to derive peak flow rate and duration information. Please reference, Section 7 - Flow Control, of this report for further information.

Water quality treatment will be provided via StormFilter. Design of this facility will be done by Contech Engineered Solutions; and will be in compliance with Volume V of the Washington State Department of Ecology regulations. Please reference, Section 6 - Runoff Treatment, of this report for further information.

Appendix 5.1
Basin Maps

Figure 5
Pre-developed Basin Map

PREDEVELOPED BASIN MAP

FOR

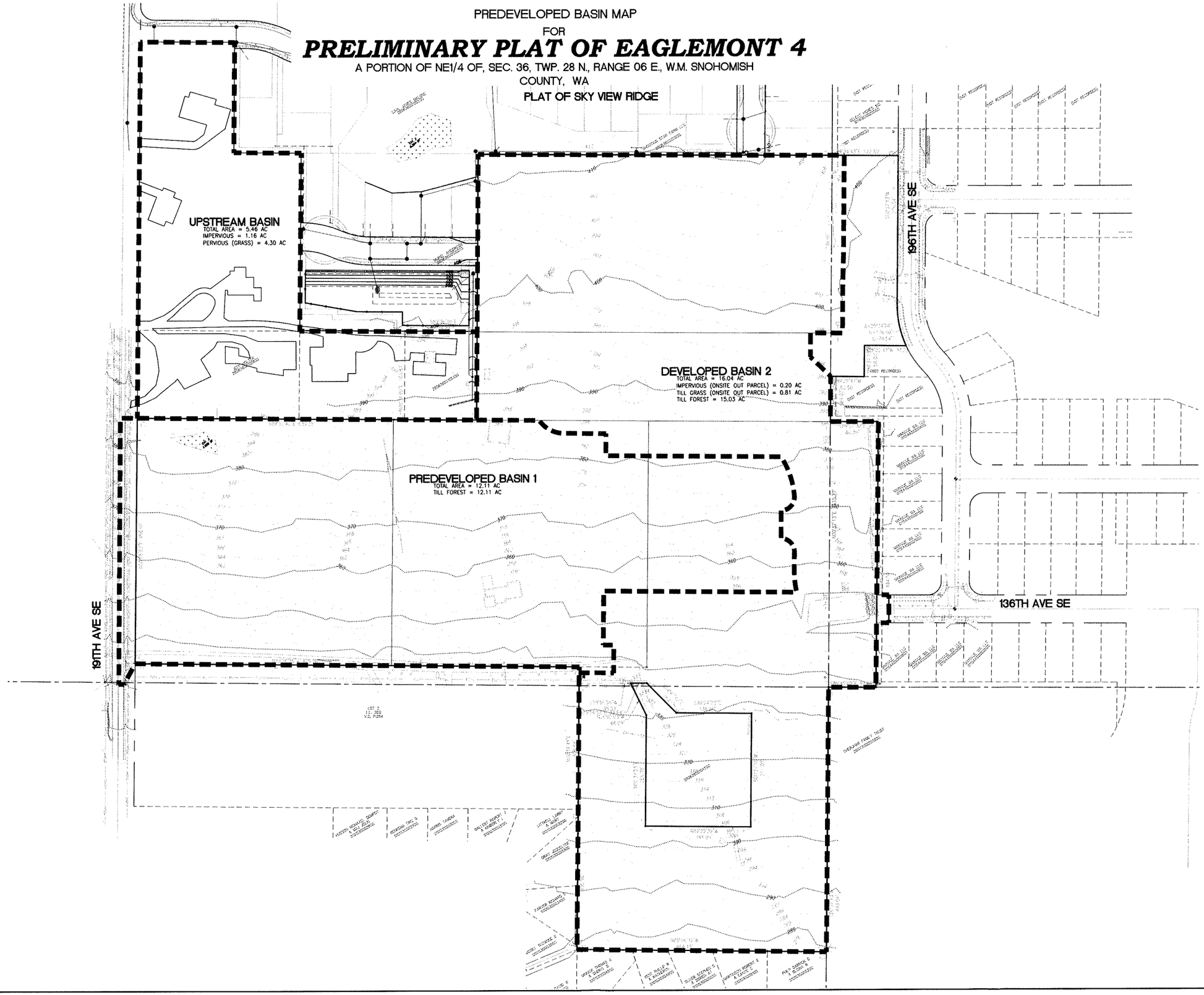
PRELIMINARY PLAT OF EAGLEMONT 4

A PORTION OF NE1/4 OF, SEC. 36, TWP. 28 N., RANGE 06 E., W.M. SNOHOMISH COUNTY, WA

PLAT OF SKY VIEW RIDGE

1"=80'

0 40 80 160



No.	Date	By	Ckd.	Appr.	Revision

Title: PREDEVELOPED BASIN MAP FOR PRELIMINARY PLAT OF EAGLEMONT 4

EAGLEMONT DEVISION 4

For:

BARGHAUSEN CONSULTING ENGINEERS, INC.

18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX

CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

BARRY J. TALKINGTON — STATE OF WASHINGTON — 41423 — REGISTERED PROFESSIONAL ENGINEER

Scale: Horizontal 1"=80' Vertical N/A

Designed RAG
Drawn RAG
Checked RAG
Approved BJT
Date 8/23/2016

Job Number 17841

Sheet 1 of 1

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Figure 6
Developed Basin Map

DEVELOPED BASIN AREA MAP

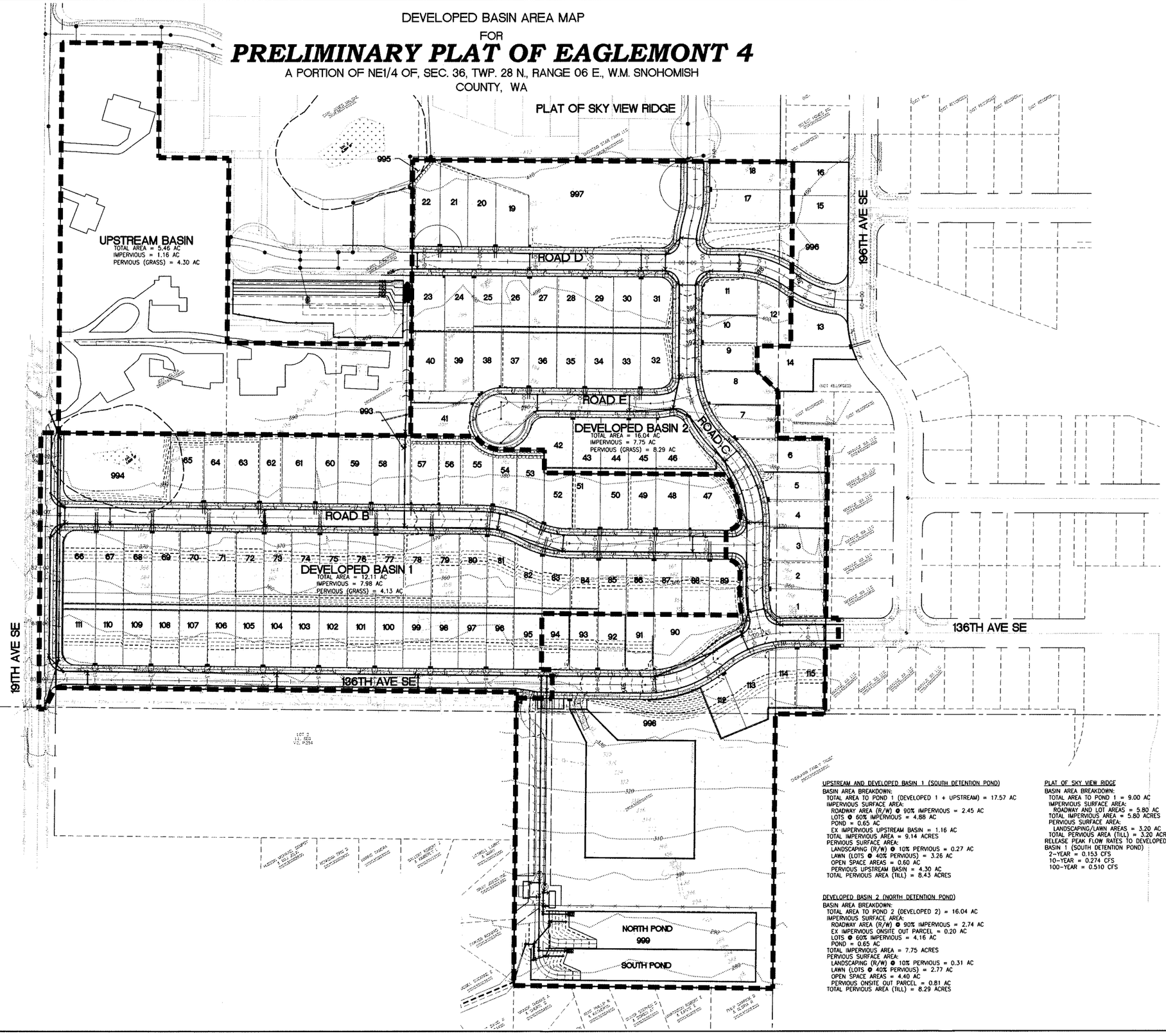
FOR

PRELIMINARY PLAT OF EAGLEMONT 4

A PORTION OF NE1/4 OF, SEC. 36, TWP. 28 N., RANGE 06 E., W.M. SNOHOMISH COUNTY, WA

1"=80'

0 40 80 160



UPSTREAM AND DEVELOPED BASIN 1 (SOUTH DETENTION POND)

BASIN AREA BREAKDOWN:
- TOTAL AREA TO POND 1 (DEVELOPED 1 + UPSTREAM) = 17.57 AC
- IMPERVIOUS SURFACE AREA:
  - ROADWAY AREA (R/W) @ 90% IMPERVIOUS = 2.45 AC
  - LOTS @ 60% IMPERVIOUS = 4.88 AC
  - POND = 0.65 AC
  - EX IMPERVIOUS UPSTREAM BASIN = 1.16 AC
- TOTAL IMPERVIOUS AREA = 9.14 ACRES
- PERVIOUS SURFACE AREA:
  - LANDSCAPING (R/W) @ 10% PERVIOUS = 0.27 AC
  - LAWN (LOTS @ 40% PERVIOUS) = 3.26 AC
  - OPEN SPACE AREAS = 0.60 AC
  - PERVIOUS UPSTREAM BASIN = 4.30 AC
- TOTAL PERVIOUS AREA (TILL) = 8.43 ACRES

DEVELOPED BASIN 2 (NORTH DETENTION POND)

BASIN AREA BREAKDOWN:
- TOTAL AREA TO POND 2 (DEVELOPED 2) = 16.04 AC
- IMPERVIOUS SURFACE AREA:
  - ROADWAY AREA (R/W) @ 90% IMPERVIOUS = 2.74 AC
  - EX IMPERVIOUS ONSITE OUT PARCEL = 0.20 AC
  - LOTS @ 60% IMPERVIOUS = 4.16 AC
  - POND = 0.65 AC
- TOTAL IMPERVIOUS AREA = 7.75 ACRES
- PERVIOUS SURFACE AREA:
  - LANDSCAPING (R/W) @ 10% PERVIOUS = 0.31 AC
  - LAWN (LOTS @ 40% PERVIOUS) = 2.77 AC
  - OPEN SPACE AREAS = 4.40 AC
  - PERVIOUS ONSITE OUT PARCEL = 0.81 AC
- TOTAL PERVIOUS AREA (TILL) = 8.29 ACRES

PLAT OF SKY VIEW RIDGE

BASIN AREA BREAKDOWN:
- TOTAL AREA TO POND 1 = 9.00 AC
- IMPERVIOUS SURFACE AREA:
  - ROADWAY AND LOT AREAS = 5.80 AC
- TOTAL IMPERVIOUS AREA = 5.80 ACRES
- PERVIOUS SURFACE AREA:
  - LANDSCAPING/LAWN AREAS = 3.20 AC
- TOTAL PERVIOUS AREA (TILL) = 3.20 ACRES

RELEASE PEAK FLOW RATES TO DEVELOPED BASIN 1 (SOUTH DETENTION POND)
- 2-YEAR = 0.153 CFS
- 10-YEAR = 0.274 CFS
- 100-YEAR = 0.510 CFS

No.	Date	By	Chd.	Appr.	Revision

Title: DEVELOPED BASIN AREA MAP FOR PRELIMINARY PLAT OF EAGLEMONT 4

For: EAGLEMONT DEVISION 4

BARGHAUSEN CONSULTING ENGINEERS, INC.

18215 72ND AVENUE SOUTH
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(425)251-8782 FAX

CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

BARRY J. TALKINGTON — STATE OF WASHINGTON — 41423 — REGISTERED PROFESSIONAL ENGINEER

Scale: Horizontal 1"=80' Vertical N/A

Designed RAG | Drawn RAG | Checked BJT | Approved | Date 8/23/2016

Job Number 17841

Sheet 1 of 1

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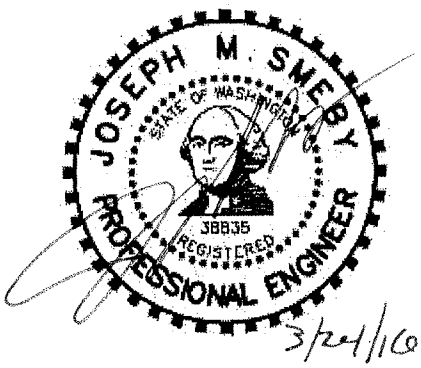
Appendix 5.2
Drainage Report for Sky View Ridge by Omega Engineers dated March 24th 2016

Drainage Report
Sky View Ridge
PFN: M2015-

for

Rick Hansen
P.O. Box 2289
Snohomish, WA 98291

SITE LOCATION:
13207 & 13221 191st Ave SE
Monroe, WA 98272



Prepared by:
Joseph M. Smeby, P.E.

Job No: 15-02093
May 2015
Construction Submittal: March 2016

TABLE OF CONTENTS

ITEM **PAGE**

LIST OF FIGURES

1. INTRODUCTION

This document is intended to provide engineering information necessary to support the construction plan application to the City of Monroe for the two phase 31 lot sub-division proposed on this site. The site covers 11.4 acres, of which approximately 9.0 acres will be cleared as a result of this project. Improvements to the east side of 191st Ave SE along this projects frontage along with a new road connection to the future 133rd St SE, as part of the Eaglemont Plat Phase 4 new public roads within the sub-division will be part of the application.

This project proposes to construct new public roads within the plat to serve the future lots. In addition, frontage improvements along the east side of 191st including new pavement, curb, planter and sidewalk will be constructed along the west side of the plat. This project will require the construction of driveways for each future lot, stormwater facilities and other utilities. The existing on-site soils are sandy loam so infiltration will not be viable for this project. The proposed detention system will provide combined detention/water quality in an open pond.

2. DRAINAGE INFORMATION SUMMARY FORM

Project: **Sky View Ridge**
PFN: **M2015-**
Engineer: **Omega Engineering, Inc.**
2707 Wetmore Ave
Everett, WA 98201
Attention: Joseph Smeby, P.E.

Total site area: **11.40 acres**
Offsite area: **0.12 acres**
Disturbed area: **9.00 acres**

Applicant: **Hanson Homes**
P.O. Box 2289
Snohomish, WA 98291

Number of lots/Bldg: **31**

Drainage Basin Information	**East Basin**
On-site Developed Area	9.00 acres
Off-site Improved Area	0.12 acres
Types of storage proposed	Detention Pond
Approximate total storage volume	160,736 cf per calc
Soil Types	Type C
Basin Data	
Pre-developed run-off rates: 2-year	0.30 cfs
50-year	0.88 cfs
Post-developed run-off rates: 2-year	0.15 cfs
50-year	0.42 cfs

3. EXISTING SITE CHARACTERISTICS and ASSUMPTIONS

The site is located east of 191st Ave SE and north of the Eaglemont Plat, and in Section 36, Township 28N, Range 6E, Willamette Meridian. See Figure 1 - Vicinity Map. The entire property consists of a multiple lots totaling 11.4 acres.

Land use around the site is single-family residential. This site currently contains some single-family buildings. Frontage improvements will be required along 191st Ave SE which will include pavement widening, curb, gutter, planter and sidewalk

The existing site is irregular in shape approximately 1,320-feet long running east-west and 330 to 660-feet running north-south. The grades on the site are moderate. The vegetation found on the existing property is a mixture of landscaping including grasses and shrubs and native vegetation.

Grades on the site generally run from north to south for the westerly basin and west to east for the easterly basin. The existing soils on this site are sandy loam, which is considered Till. Please refer to the attached geotechnical report in Appendix C for further discussion of the existing on-site soils. A site visit was conducted on April 17, 2015. The weather was overcast with temperatures in the 50's. No surface water was observed on this site.

The soil hydrologic types for this site have been identified as Type C or Till from the Snohomish County Soil Survey Map, see figure 5. The soil type mapped for this site is Ragnar fine sandy loam. Soil tests on this site found weathered till under 10-18" of topsoil. With hardpan at 1.8-2.5'. Refer to Geotechnical Report in Appendix C. The project Geotech therefore has not recommended that infiltration be used for this project.

4. NARRATIVE OF DEVELOPED SITE CHARACTERISTICS

This development proposes to create 31 new lots in three phases. The detention system will be designed for both on-site basins since they fall within a single "threshold discharge area" and the system has been sized to meet the 2005 DOE stormwater flow control and water quality standards.

The undisturbed area is mainly in the power line easement area and the Cat. III wetland and buffer area. These areas will be collected in the on-site conveyance system and flow through the detention/water quality ponds. The storm drainage system for this project has been designed to collect, treat and detain all of the new landscaping and impervious areas on this site. The off-site new impervious areas within 191st Ave SE will be collected as well and conveyed to the pond for treatment and flow control.

The detention and water quality system has been designed using the WWHM3 software and meet the current State and City standards.

6. OFFSITE DRAINAGE ANALYSIS - UPSTREAM

From field observation and review of the available topography, it appears that some small areas to the north of this project will drain onto the site but the majority of the offsite area to the north drains to the east, away from the site. These flows are negligible in the existing condition and will be collected on-site and passed through the site in the developed condition.

7. OFFSITE DRAINAGE ANALYSIS - DOWNSTREAM

The project is bordered to the south and east by the Eaglemont Plat. Since the proposed plat will account for the upstream offsite flows this project will provide a connection from the detention pond outfall to the future conveyance system for that plat. However, in the interim a level spreader has been sized with the necessary vegetated flow path to provide an outfall that can be utilized long-term if necessary. Therefore, the project will connect into an engineered conveyance system which has been sized to accommodate the existing upstream tributary flows. The release rates from this projected will match or be less than the existing conditions.

8. DETENTION STORAGE CALCULATIONS

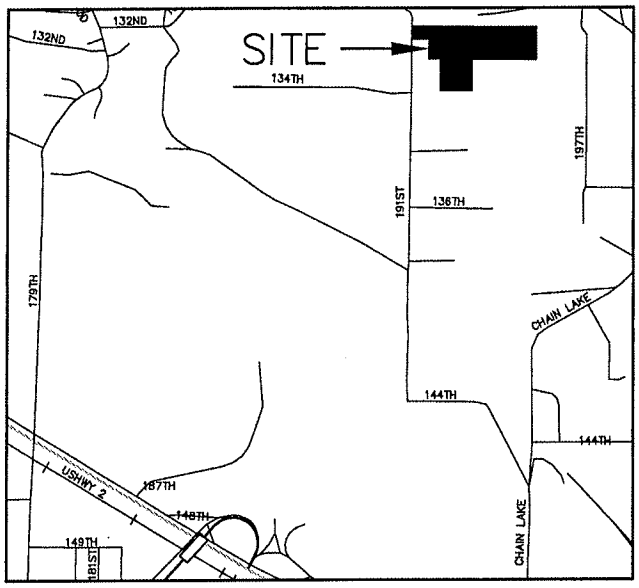
Current City code requires this site be analyzed using the 2005 DOE manual and the WWHM3 stormwater software. Since this site proposes using a combined detention/water quality pond the software will be used to size the system.

The pond has been sized to accommodate the developed conditions for this project and will release the flows to the south. At this time a level spreader is proposed but the future phases of the Eaglemont Plat will provide a connection point for the vault outfall and the system will be piped through the Eaglemont project.

Refer to appendix 'A' for the full output from the WWHM3 software.

9. WATER QUALITY DESIGN

Water quality for this project will be provided in the form of a combined detention/water quality pond. The WWHM3 software was used to calculate the required dead storage volume.



VICINITY MAP
SCALE 1" = 2000'

FIG. 1

OMEGA
ENGINEERING, INC.
2707 WETMORE AVE.
Everett, WA 98201
(o)425.387.3820 (f) 425.259.1958

VICINITY MAP
SKY VIEW RIDGE

DATE	JOB NO.	SCALE	SHEET
3/24/16	15-0209	1" = 2000'	1 OF 1

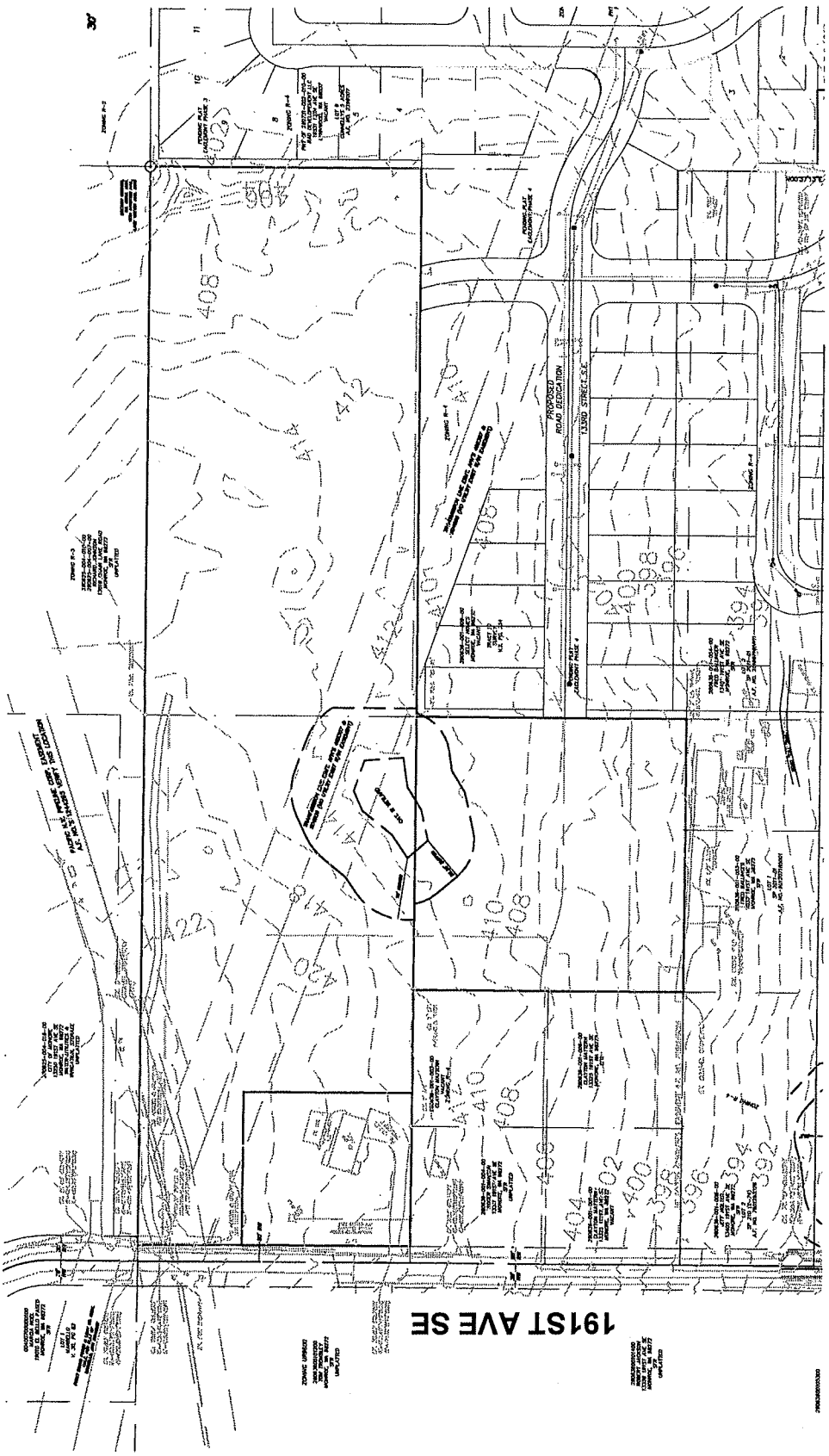


FIG. 2

OMEGA
ENGINEERING, INC.
2707 WETMORE AVE.
Everett, WA 98201
(o)425.387.3820 (f) 425.259.1958

EXISTING BASIN MAP
SKY VIEW RIDGE

DATE	JOB NO.	SCALE	SHEET
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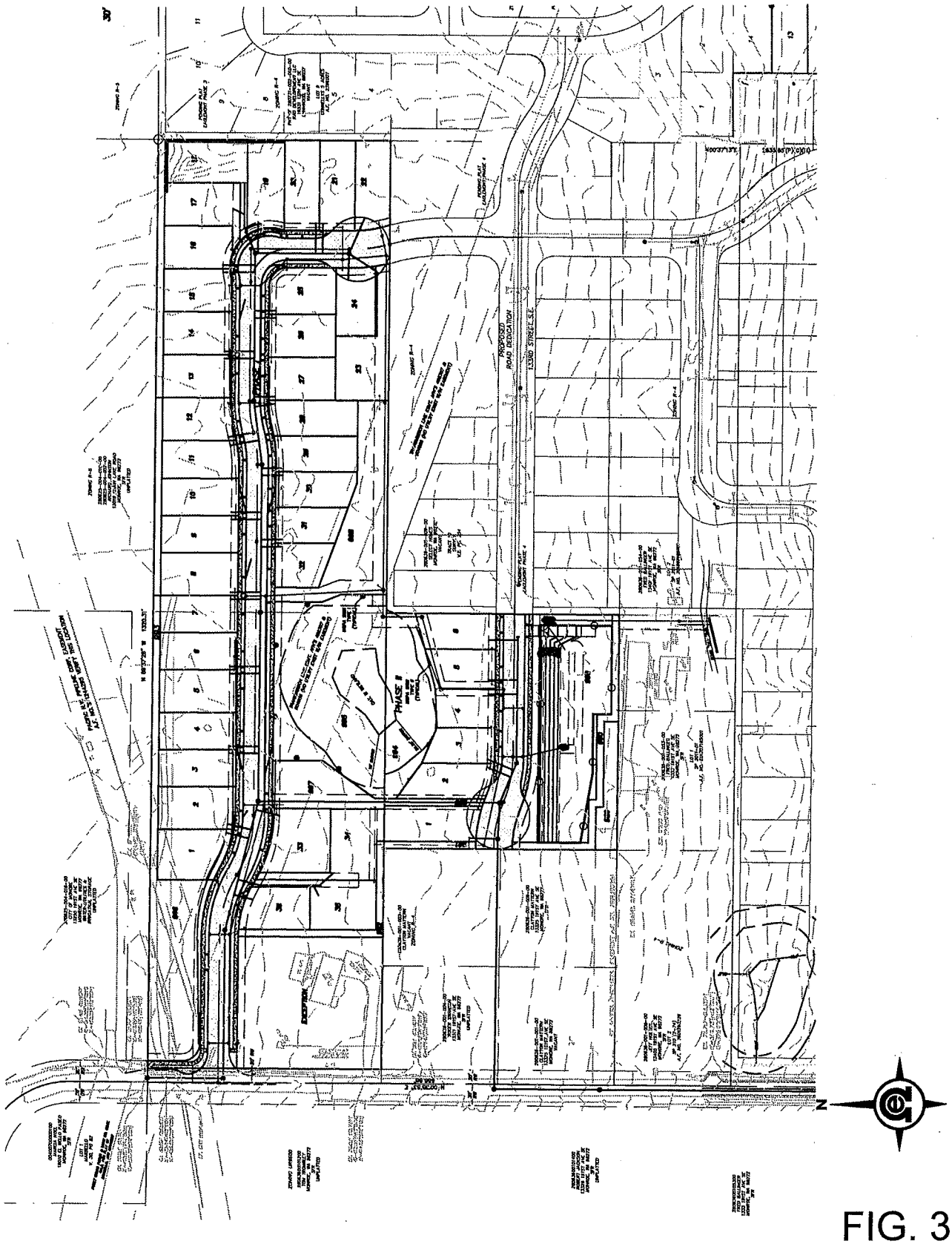


FIG. 3

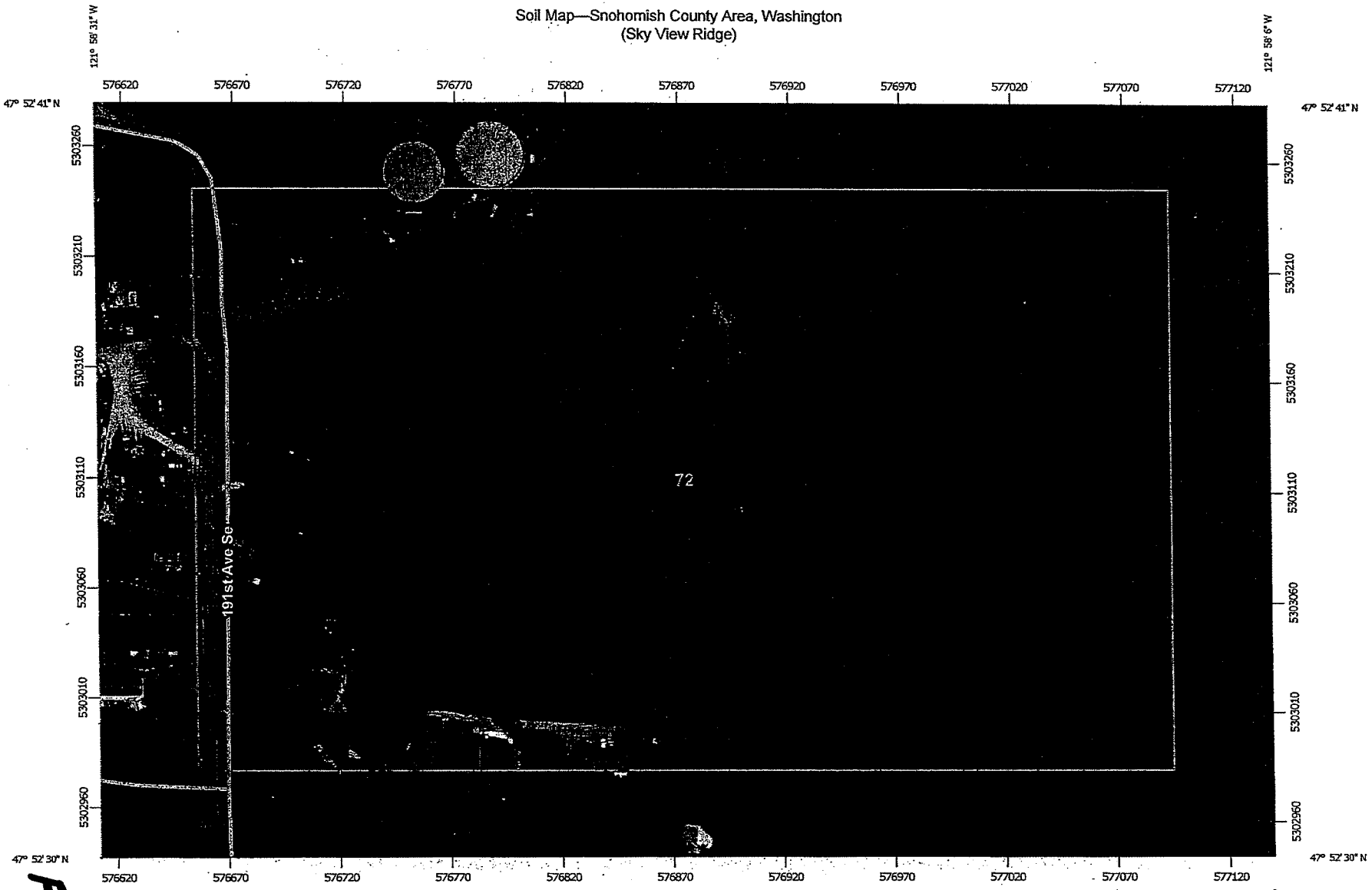
OMEGA
ENGINEERING, INC.

2707 WETMORE AVE.
Everett, WA 98201
(o)425.387.3820 (f) 425.259.1958

DEVELOPED BASIN MAP
SKY VIEW RIDGE

DATE	JOB NO.	SCALE	SHEET
3/24/16	15-0209	1" = 200'	1 OF 1

Soil Map—Snohomish County Area, Washington
(Sky View Ridge)



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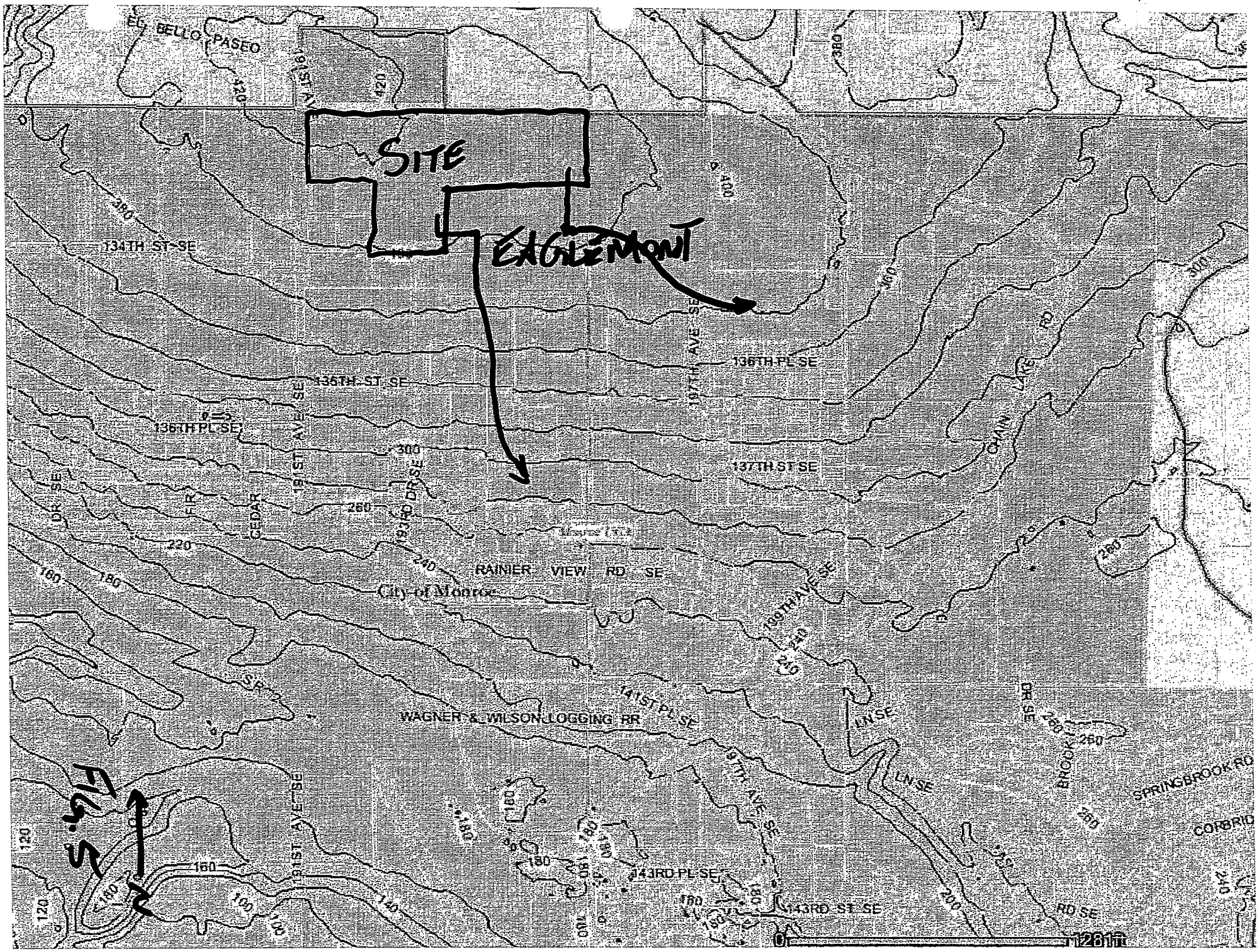
N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Fig 4


SITE
EAGLEMONT
EL BELLO PASEO
134TH ST SE
135TH ST SE
136TH PL SE
137TH ST SE
CEDAR DR SE
RAINIER VIEW RD SE
City of Monroe
WAGNER & WILSON LOGGING RR
143RD PL SE
143RD ST SE
SPRINGBROOK RD
0
1261ft

APPENDIX A

STORMWATER CALCULATIONS

Western Washington Hydrology Model
PROJECT REPORT

Project Name: combine
Site Address:
City : Monroe
Report Date : 2/26/2016
Gage : Everett
Data Start : 1948/10/01
Data End : 1997/09/30
Precip Scale: 1.20
WWHM3 Version:

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	9

Impervious Land Use	Acres

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Lawn, Flat	3.2

Impervious Land Use	Acres
ROADS FLAT	5.8

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1,	Trapezoidal Pond 1,	

Name : Trapezoidal Pond 1
Bottom Length: 300ft.

Bottom Width: 54ft.
Depth : 9ft.
Volume at riser head : 3.6902ft.
Side slope 1: 3 To 1
Side slope 2: 0.0001 To 1
Side slope 3: 0.00001 To 1
Side slope 4: 0.0001 To 1

Discharge Structure

Riser Height: 8 ft.
Riser Diameter: 18 in.
NotchType : Rectangular
Notch Width : 0.028 ft.
Notch Height: 3.552 ft.
Orifice 1 Diameter: 1.653 in. **Elevation:** 0 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	0.372	0.000	0.000	0.000
0.100	0.374	0.037	0.023	0.000
0.200	0.376	0.075	0.032	0.000
0.300	0.378	0.113	0.039	0.000
0.400	0.380	0.150	0.045	0.000
0.500	0.382	0.189	0.051	0.000
0.600	0.384	0.227	0.056	0.000
0.700	0.386	0.265	0.060	0.000
0.800	0.388	0.304	0.064	0.000
0.900	0.390	0.343	0.068	0.000
1.000	0.393	0.382	0.072	0.000
1.100	0.395	0.422	0.075	0.000
1.200	0.397	0.461	0.079	0.000
1.300	0.399	0.501	0.082	0.000
1.400	0.401	0.541	0.085	0.000
1.500	0.403	0.581	0.088	0.000
1.600	0.405	0.621	0.091	0.000
1.700	0.407	0.662	0.094	0.000
1.800	0.409	0.703	0.096	0.000
1.900	0.411	0.744	0.099	0.000
2.000	0.413	0.785	0.101	0.000
2.100	0.415	0.827	0.104	0.000
2.200	0.417	0.868	0.106	0.000
2.300	0.419	0.910	0.109	0.000
2.400	0.421	0.952	0.111	0.000
2.500	0.424	0.994	0.113	0.000
2.600	0.426	1.037	0.116	0.000
2.700	0.428	1.079	0.118	0.000
2.800	0.430	1.122	0.120	0.000
2.900	0.432	1.165	0.122	0.000
3.000	0.434	1.209	0.124	0.000
3.100	0.436	1.252	0.126	0.000
3.200	0.438	1.296	0.128	0.000
3.300	0.440	1.340	0.130	0.000

3.400	0.442	1.384	0.132	0.000
3.500	0.444	1.428	0.134	0.000
3.600	0.446	1.473	0.136	0.000
3.700	0.448	1.517	0.138	0.000
3.800	0.450	1.562	0.140	0.000
3.900	0.452	1.608	0.142	0.000
4.000	0.455	1.653	0.144	0.000
4.100	0.457	1.698	0.145	0.000
4.200	0.459	1.744	0.147	0.000
4.300	0.461	1.790	0.149	0.000
4.400	0.463	1.836	0.151	0.000
4.500	0.465	1.883	0.153	0.000
4.600	0.467	1.929	0.159	0.000
4.700	0.469	1.976	0.167	0.000
4.800	0.471	2.023	0.175	0.000
4.900	0.473	2.070	0.184	0.000
5.000	0.475	2.118	0.194	0.000
5.100	0.477	2.165	0.204	0.000
5.200	0.479	2.213	0.214	0.000
5.300	0.481	2.261	0.225	0.000
5.400	0.483	2.310	0.236	0.000
5.500	0.486	2.358	0.247	0.000
5.600	0.488	2.407	0.260	0.000
5.700	0.490	2.455	0.274	0.000
5.800	0.492	2.505	0.288	0.000
5.900	0.494	2.554	0.338	0.000
6.000	0.496	2.603	0.357	0.000
6.100	0.498	2.653	0.376	0.000
6.200	0.500	2.703	0.396	0.000
6.300	0.502	2.753	0.416	0.000
6.400	0.504	2.803	0.437	0.000
6.500	0.506	2.854	0.458	0.000
6.600	0.508	2.905	0.480	0.000
6.700	0.510	2.955	0.502	0.000
6.800	0.512	3.007	0.525	0.000
6.900	0.514	3.058	0.548	0.000
7.000	0.517	3.110	0.572	0.000
7.100	0.519	3.161	0.596	0.000
7.200	0.521	3.213	0.620	0.000
7.300	0.523	3.265	0.645	0.000
7.400	0.525	3.318	0.670	0.000
7.500	0.527	3.370	0.696	0.000
7.600	0.529	3.423	0.722	0.000
7.700	0.531	3.476	0.748	0.000
7.800	0.533	3.529	0.775	0.000
7.900	0.535	3.583	0.802	0.000
8.000	0.537	3.636	0.830	0.000
8.100	0.539	3.690	1.293	0.000
8.200	0.541	3.744	2.139	0.000
8.300	0.543	3.798	3.234	0.000
8.400	0.545	3.853	4.530	0.000
8.500	0.548	3.908	6.001	0.000
8.600	0.550	3.962	7.627	0.000
8.700	0.552	4.017	9.394	0.000
8.800	0.554	4.073	11.29	0.000
8.900	0.556	4.128	13.31	0.000
9.000	0.558	4.184	15.45	0.000

9.100	0.560	4.240	17.70	0.000

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.295424
5 year	0.443299
10 year	0.560396
25 year	0.732143
50 year	0.878651
100 year	1.042189

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.152946
5 year	0.219636
10 year	0.273923
25 year	0.355482
50 year	0.426659
100 year	0.507667

Yearly Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1950	0.197	0.130
1951	0.555	0.148
1952	0.198	0.125
1953	0.234	0.120
1954	0.315	0.120
1955	0.515	0.140
1956	0.482	0.232
1957	0.324	0.249
1958	0.520	0.174
1959	0.500	0.136
1960	0.282	0.142
1961	0.255	0.149
1962	0.353	0.209
1963	0.452	0.122
1964	0.716	0.132
1965	0.253	0.109
1966	0.247	0.148
1967	0.151	0.125
1968	0.325	0.127
1969	0.366	0.150
1970	0.554	0.135
1971	0.196	0.129
1972	0.311	0.284
1973	0.240	0.138
1974	0.203	0.150
1975	0.266	0.143
1976	0.217	0.118

1977	0.188	0.139
1978	0.173	0.127
1979	0.215	0.120
1980	0.763	0.129
1981	0.218	0.120
1982	0.273	0.121
1983	0.235	0.176
1984	0.281	0.128
1985	0.269	0.320
1986	0.376	0.214
1987	0.788	0.489
1988	0.379	0.381
1989	0.190	0.188
1990	0.370	0.118
1991	0.255	0.163
1992	0.267	0.146
1993	0.249	0.152
1994	0.152	0.110
1995	0.168	0.150
1996	0.258	0.211
1997	0.459	0.186
1998	1.062	0.784

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.0621	0.7843
2	0.7879	0.4894
3	0.7634	0.3805
4	0.7162	0.3198
5	0.5553	0.2835
6	0.5539	0.2491
7	0.5202	0.2321
8	0.5152	0.2142
9	0.4995	0.2111
10	0.4815	0.2091
11	0.4592	0.1884
12	0.4522	0.1858
13	0.3795	0.1759
14	0.3764	0.1736
15	0.3696	0.1630
16	0.3655	0.1520
17	0.3527	0.1501
18	0.3247	0.1499
19	0.3243	0.1498
20	0.3155	0.1487
21	0.3114	0.1481
22	0.2822	0.1478
23	0.2810	0.1460
24	0.2732	0.1435
25	0.2687	0.1416
26	0.2666	0.1397
27	0.2661	0.1393
28	0.2584	0.1376
29	0.2554	0.1356
30	0.2553	0.1346
31	0.2533	0.1324

32	0.2493	0.1305
33	0.2473	0.1293
34	0.2397	0.1286
35	0.2348	0.1284
36	0.2343	0.1275
37	0.2185	0.1267
38	0.2165	0.1249
39	0.2150	0.1246
40	0.2031	0.1223
41	0.1979	0.1205
42	0.1968	0.1203
43	0.1964	0.1202
44	0.1902	0.1202
45	0.1883	0.1197
46	0.1730	0.1176
47	0.1681	0.1175
48	0.1516	0.1101
49	0.1514	0.1087

POC #1

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
0.1477	3446	2220	64	Pass
0.1551	2946	1395	47	Pass
0.1625	2600	1186	45	Pass
0.1699	2286	1006	44	Pass
0.1772	1949	834	42	Pass
0.1846	1725	693	40	Pass
0.1920	1474	562	38	Pass
0.1994	1279	500	39	Pass
0.2068	1127	448	39	Pass
0.2142	986	383	38	Pass
0.2215	865	338	39	Pass
0.2289	752	293	38	Pass
0.2363	641	252	39	Pass
0.2437	564	231	40	Pass
0.2511	490	205	41	Pass
0.2585	431	191	44	Pass
0.2658	389	175	44	Pass
0.2732	347	161	46	Pass
0.2806	311	147	47	Pass
0.2880	280	136	48	Pass
0.2954	251	132	52	Pass
0.3028	233	128	54	Pass
0.3101	215	124	57	Pass
0.3175	202	119	58	Pass
0.3249	188	114	60	Pass
0.3323	174	113	64	Pass
0.3397	162	110	67	Pass
0.3471	154	106	68	Pass
0.3544	142	103	72	Pass
0.3618	135	100	74	Pass
0.3692	130	94	72	Pass
0.3766	123	88	71	Pass

0.3840	119	84	70	Pass
0.3914	115	82	71	Pass
0.3987	112	79	70	Pass
0.4061	109	76	69	Pass
0.4135	103	74	71	Pass
0.4209	97	72	74	Pass
0.4283	95	67	70	Pass
0.4357	94	62	65	Pass
0.4430	91	60	65	Pass
0.4504	89	58	65	Pass
0.4578	85	54	63	Pass
0.4652	81	52	64	Pass
0.4726	76	50	65	Pass
0.4800	75	49	65	Pass
0.4873	72	44	61	Pass
0.4947	69	42	60	Pass
0.5021	67	42	62	Pass
0.5095	66	41	62	Pass
0.5169	63	40	63	Pass
0.5243	61	40	65	Pass
0.5316	60	39	65	Pass
0.5390	58	38	65	Pass
0.5464	57	35	61	Pass
0.5538	55	31	56	Pass
0.5612	52	29	55	Pass
0.5686	51	27	52	Pass
0.5759	48	26	54	Pass
0.5833	47	25	53	Pass
0.5907	44	25	56	Pass
0.5981	42	23	54	Pass
0.6055	39	22	56	Pass
0.6129	38	22	57	Pass
0.6202	36	21	58	Pass
0.6276	35	20	57	Pass
0.6350	34	19	55	Pass
0.6424	34	18	52	Pass
0.6498	32	18	56	Pass
0.6572	31	17	54	Pass
0.6645	30	16	53	Pass
0.6719	29	15	51	Pass
0.6793	28	14	50	Pass
0.6867	24	14	58	Pass
0.6941	24	13	54	Pass
0.7015	23	13	56	Pass
0.7088	20	12	60	Pass
0.7162	20	11	55	Pass
0.7236	18	10	55	Pass
0.7310	16	10	62	Pass
0.7384	16	9	56	Pass
0.7458	13	8	61	Pass
0.7531	13	7	53	Pass
0.7605	13	5	38	Pass
0.7679	11	5	45	Pass
0.7753	11	4	36	Pass
0.7827	11	4	36	Pass
0.7901	8	0	0	Pass
0.7974	8	0	0	Pass

0.8048	6	0	0	Pass
0.8122	6	0	0	Pass
0.8196	5	0	0	Pass
0.8270	3	0	0	Pass
0.8344	3	0	0	Pass
0.8417	3	0	0	Pass
0.8491	3	0	0	Pass
0.8565	2	0	0	Pass
0.8639	2	0	0	Pass
0.8713	2	0	0	Pass
0.8787	2	0	0	Pass

Water Quality BMP Flow and Volume for POC 1.
On-line facility volume: 0.2425 acre-feet
On-line facility target flow: 0.01 **cfs.**
Adjusted for 15 min: 0.1328 **cfs.**
Off-line facility target flow: 0.0824 **cfs.**
Adjusted for 15 min: 0.0893 **cfs.**

Perlnd and Implnd Changes

No changes have been made.

Tab 6.0

SECTION 6 - RUNOFF TREATMENT

Runoff treatment will be provided by two StormFilters, one located immediately upstream of each of the two proposed detention ponds. The StormFilter sizing calculations and details will be provided during final engineering.

Appendix 6.1
Water Quality Design Calculations

Tab 7.0

SECTION 7 - FLOW CONTROL

Surface runoff from the site will be routed to one of the two open detention/treatment ponds in the south end of the site. A detailed breakdown of the basin areas can be located in Section 5 - On-site Stormwater management, of this report. The detention ponds within Tract 999 have been sized using WWHM2012 stormwater program, and perform hydraulically separate of one another. Discharges are designed to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50 percent of the two-year peak flow up to the full 50-year peak flow. These design calculations are provided in Appendix 7.1 located within this section of the report.

Appendix 7.1
Flow Control Design Calculations

South Detention Pond
WWHM2012
PROJECT REPORT

Project Name: 17841-Eaglemont 4-Pond 1-With Skyview-3ori
Site Name: Eaglemont 4
Site Address: 13511 191ST AVE SE
City : Monroe
Report Date: 8/18/2016
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2016/02/25
Version : 4.2.12

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	12.11
Pervious Total	12.11

Impervious Land Use	acre
Impervious Total	0
Basin Total	12.11

Element Flows To:

Surface	Interflow	Groundwater

Name : Upstream Basin
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Mod	4.3

Pervious Total	4.3

Impervious Land Use	acre
ROADS FLAT	1.16
Impervious Total	1.16
Basin Total	5.46

Element Flows To:
Surface Interflow Groundwater

Name : Sky View Ridge
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	9
Pervious Total	9

Impervious Land Use	acre
Impervious Total	0
Basin Total	9

Element Flows To:
Surface Interflow Groundwater

MITIGATED LAND USE

Name : Basin
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	4.09
C, Lawn, Mod	.04
Pervious Total	4.13

Impervious Land Use	acre
ROADS FLAT	2.05
ROADS MOD	0.4
ROOF TOPS FLAT	4.88
POND	0.65
Impervious Total	7.98
Basin Total	12.11

Element Flows To:

Surface	Interflow	Groundwater
Pond	Pond	

Name : Upstream Basin
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Mod	4.3
Pervious Total	4.3

Impervious Land Use	acre
ROADS FLAT	1.16
Impervious Total	1.16
Basin Total	5.46

Element Flows To:

Surface	Interflow	Groundwater
Pond	Pond	

South Detention Vault

Name : Pond
Width : 114.650358665796 ft. Require Volume = 140,742 CF
Length : 114.650358665796 ft.
Depth: 11.75 ft.

Discharge Structure

Riser Height: 10.75 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 4.14 in. **Elevation:** 0 ft.
Orifice 2 Diameter: 6.93 in. **Elevation:** 9.95025 ft.
Orifice 3 Diameter: 4.23 in. **Elevation:** 10.8425 ft.

Element Flows To:

Outlet 1 **Outlet 2**

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.301	0.000	0.000	0.000
0.1306	0.301	0.039	0.168	0.000
0.2611	0.301	0.078	0.237	0.000
0.3917	0.301	0.118	0.291	0.000
0.5222	0.301	0.157	0.336	0.000
0.6528	0.301	0.197	0.375	0.000
0.7833	0.301	0.236	0.411	0.000
0.9139	0.301	0.275	0.444	0.000
1.0444	0.301	0.315	0.475	0.000
1.1750	0.301	0.354	0.504	0.000
1.3056	0.301	0.394	0.531	0.000
1.4361	0.301	0.433	0.557	0.000
1.5667	0.301	0.472	0.582	0.000
1.6972	0.301	0.512	0.605	0.000
1.8278	0.301	0.551	0.628	0.000
1.9583	0.301	0.590	0.650	0.000
2.0889	0.301	0.630	0.672	0.000
2.2194	0.301	0.669	0.692	0.000
2.3500	0.301	0.709	0.713	0.000
2.4806	0.301	0.748	0.732	0.000
2.6111	0.301	0.787	0.751	0.000
2.7417	0.301	0.827	0.770	0.000
2.8722	0.301	0.866	0.788	0.000
3.0028	0.301	0.906	0.806	0.000
3.1333	0.301	0.945	0.823	0.000
3.2639	0.301	0.984	0.840	0.000
3.3944	0.301	1.024	0.856	0.000
3.5250	0.301	1.063	0.873	0.000
3.6556	0.301	1.103	0.889	0.000
3.7861	0.301	1.142	0.905	0.000
3.9167	0.301	1.181	0.920	0.000
4.0472	0.301	1.221	0.935	0.000
4.1778	0.301	1.260	0.950	0.000
4.3083	0.301	1.300	0.965	0.000
4.4389	0.301	1.339	0.979	0.000
4.5694	0.301	1.378	0.994	0.000
4.7000	0.301	1.418	1.008	0.000
4.8306	0.301	1.457	1.022	0.000
4.9611	0.301	1.497	1.036	0.000
5.0917	0.301	1.536	1.049	0.000
5.2222	0.301	1.575	1.062	0.000
5.3528	0.301	1.615	1.076	0.000
5.4833	0.301	1.654	1.089	0.000
5.6139	0.301	1.694	1.102	0.000
5.7444	0.301	1.733	1.114	0.000
5.8750	0.301	1.772	1.127	0.000
6.0056	0.301	1.812	1.139	0.000
6.1361	0.301	1.851	1.152	0.000
6.2667	0.301	1.891	1.164	0.000

6.3972	0.301	1.930	1.176	0.000
6.5278	0.301	1.969	1.188	0.000
6.6583	0.301	2.009	1.200	0.000
6.7889	0.301	2.048	1.211	0.000
6.9194	0.301	2.088	1.223	0.000
7.0500	0.301	2.127	1.235	0.000
7.1806	0.301	2.166	1.246	0.000
7.3111	0.301	2.206	1.257	0.000
7.4417	0.301	2.245	1.268	0.000
7.5722	0.301	2.285	1.279	0.000
7.7028	0.301	2.324	1.290	0.000
7.8333	0.301	2.363	1.301	0.000
7.9639	0.301	2.403	1.312	0.000
8.0944	0.301	2.442	1.323	0.000
8.2250	0.301	2.482	1.333	0.000
8.3556	0.301	2.521	1.344	0.000
8.4861	0.301	2.560	1.354	0.000
8.6167	0.301	2.600	1.365	0.000
8.7472	0.301	2.639	1.375	0.000
8.8778	0.301	2.679	1.385	0.000
9.0083	0.301	2.718	1.396	0.000
9.1389	0.301	2.757	1.406	0.000
9.2694	0.301	2.797	1.416	0.000
9.4000	0.301	2.836	1.426	0.000
9.5306	0.301	2.875	1.435	0.000
9.6611	0.301	2.915	1.445	0.000
9.7917	0.301	2.954	1.455	0.000
9.9222	0.301	2.994	1.465	0.000
10.053	0.301	3.033	1.892	0.000
10.183	0.301	3.072	2.113	0.000
10.314	0.301	3.112	2.279	0.000
10.444	0.301	3.151	2.419	0.000
10.575	0.301	3.191	2.542	0.000
10.706	0.301	3.230	2.654	0.000
10.836	0.301	3.269	3.159	0.000
10.967	0.301	3.309	4.603	0.000
11.097	0.301	3.348	6.231	0.000
11.228	0.301	3.388	7.766	0.000
11.358	0.301	3.427	8.914	0.000
11.489	0.301	3.466	9.616	0.000
11.619	0.301	3.506	10.30	0.000
11.750	0.301	3.545	10.89	0.000
11.881	0.974	10.83	11.44	0.000

Name : Sky View Ridge
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Lawn, Flat	**3.2**

Pervious Total	**3.2**

Impervious Land Use	**acre**
ROADS FLAT	**5.8**

Impervious Total 5.8

Basin Total 9

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Sky View Ridge Detention Pond

Name : Trapezoidal Pond 1
Bottom Length: 300.00 ft.
Bottom Width: 54.00 ft.
Depth: 9 ft.
Volume at riser head: 3.1344 acre-feet.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 8 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.028 ft.
Notch Height: 3.552 ft.
Orifice 1 Diameter: 1.653 in. **Elevation:** 0 ft.

Element Flows To:

Outlet 1	Outlet 2
Pond	

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.371	0.000	0.000	0.000
0.1000	0.372	0.037	0.023	0.000
0.2000	0.372	0.074	0.033	0.000
0.3000	0.373	0.111	0.040	0.000
0.4000	0.373	0.149	0.046	0.000
0.5000	0.373	0.186	0.052	0.000
0.6000	0.374	0.223	0.057	0.000
0.7000	0.374	0.261	0.062	0.000
0.8000	0.374	0.298	0.066	0.000
0.9000	0.375	0.336	0.070	0.000
1.0000	0.375	0.373	0.074	0.000
1.1000	0.376	0.411	0.077	0.000
1.2000	0.376	0.449	0.081	0.000
1.3000	0.376	0.486	0.084	0.000
1.4000	0.377	0.524	0.087	0.000
1.5000	0.377	0.562	0.090	0.000
1.6000	0.377	0.599	0.093	0.000

1.7000	0.378	0.637	0.096	0.000
1.8000	0.378	0.675	0.099	0.000
1.9000	0.379	0.713	0.102	0.000
2.0000	0.379	0.751	0.104	0.000
2.1000	0.379	0.789	0.107	0.000
2.2000	0.380	0.827	0.110	0.000
2.3000	0.380	0.865	0.112	0.000
2.4000	0.380	0.903	0.114	0.000
2.5000	0.381	0.941	0.117	0.000
2.6000	0.381	0.979	0.119	0.000
2.7000	0.381	1.017	0.121	0.000
2.8000	0.382	1.055	0.124	0.000
2.9000	0.382	1.094	0.126	0.000
3.0000	0.383	1.132	0.128	0.000
3.1000	0.383	1.170	0.130	0.000
3.2000	0.383	1.209	0.132	0.000
3.3000	0.384	1.247	0.134	0.000
3.4000	0.384	1.286	0.136	0.000
3.5000	0.384	1.324	0.138	0.000
3.6000	0.385	1.362	0.140	0.000
3.7000	0.385	1.401	0.142	0.000
3.8000	0.386	1.440	0.144	0.000
3.9000	0.386	1.478	0.146	0.000
4.0000	0.386	1.517	0.148	0.000
4.1000	0.387	1.556	0.150	0.000
4.2000	0.387	1.594	0.152	0.000
4.3000	0.387	1.633	0.153	0.000
4.4000	0.388	1.672	0.155	0.000
4.5000	0.388	1.711	0.158	0.000
4.6000	0.389	1.750	0.164	0.000
4.7000	0.389	1.789	0.172	0.000
4.8000	0.389	1.828	0.180	0.000
4.9000	0.390	1.867	0.189	0.000
5.0000	0.390	1.906	0.199	0.000
5.1000	0.390	1.945	0.210	0.000
5.2000	0.391	1.984	0.220	0.000
5.3000	0.391	2.023	0.231	0.000
5.4000	0.392	2.062	0.242	0.000
5.5000	0.392	2.101	0.254	0.000
5.6000	0.392	2.141	0.267	0.000
5.7000	0.393	2.180	0.281	0.000
5.8000	0.393	2.219	0.295	0.000
5.9000	0.393	2.258	0.352	0.000
6.0000	0.394	2.298	0.372	0.000
6.1000	0.394	2.337	0.392	0.000
6.2000	0.395	2.377	0.413	0.000
6.3000	0.395	2.416	0.434	0.000
6.4000	0.395	2.456	0.456	0.000
6.5000	0.396	2.495	0.478	0.000
6.6000	0.396	2.535	0.501	0.000
6.7000	0.396	2.575	0.524	0.000
6.8000	0.397	2.614	0.548	0.000
6.9000	0.397	2.654	0.572	0.000
7.0000	0.397	2.694	0.597	0.000
7.1000	0.398	2.734	0.622	0.000
7.2000	0.398	2.774	0.648	0.000
7.3000	0.399	2.814	0.674	0.000

7.4000	0.399	2.853	0.701	0.000
7.5000	0.399	2.893	0.728	0.000
7.6000	0.400	2.933	0.755	0.000
7.7000	0.400	2.973	0.783	0.000
7.8000	0.400	3.014	0.811	0.000
7.9000	0.401	3.054	0.840	0.000
8.0000	0.401	3.094	0.869	0.000
8.1000	0.402	3.134	1.372	0.000
8.2000	0.402	3.174	2.276	0.000
8.3000	0.402	3.214	3.374	0.000
8.4000	0.403	3.255	4.506	0.000
8.5000	0.403	3.295	5.514	0.000
8.6000	0.403	3.335	6.277	0.000
8.7000	0.404	3.376	6.770	0.000
8.8000	0.404	3.416	7.217	0.000
8.9000	0.405	3.457	7.603	0.000
9.0000	0.405	3.497	7.968	0.000
9.1000	0.405	3.538	8.315	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:25.41
Total Impervious Area:1.16

Mitigated Landuse Totals for POC #1
Total Pervious Area:11.63
Total Impervious Area:14.94

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	1.969537
5 year	3.20157
10 year	4.171889
25 year	5.578479
50 year	6.761061
100 year	8.062292

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.918266
5 year	1.229719
10 year	1.464973
25 year	1.797047
50 year	2.071027
100 year	2.368983

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	2.713	0.860
1950	2.919	0.878
1951	1.671	0.840
1952	1.960	0.757
1953	2.263	0.703
1954	6.042	0.871
1955	2.702	1.011
1956	1.524	0.962
1957	2.739	1.059
1958	5.646	1.018
1959	1.684	0.885
1960	2.384	1.002
1961	7.649	1.055
1962	2.040	0.884
1963	3.652	0.917
1964	2.091	0.844
1965	0.923	0.864
1966	0.888	0.699
1967	1.662	0.903
1968	2.164	1.084
1969	7.302	0.818
1970	1.369	0.749
1971	2.349	0.966
1972	2.666	1.008
1973	1.990	0.792
1974	3.309	0.813
1975	2.425	0.752
1976	1.266	0.949
1977	1.035	0.807
1978	1.146	0.698
1979	4.176	1.074
1980	1.927	0.802
1981	1.379	0.817
1982	1.317	1.143
1983	2.763	0.869
1984	1.682	1.056
1985	2.244	1.001
1986	4.402	2.421
1987	1.804	1.218
1988	1.556	0.942
1989	2.151	0.675
1990	1.283	0.908
1991	1.150	0.906
1992	1.885	0.790
1993	1.285	0.783
1994	0.939	0.889
1995	1.091	0.974
1996	2.801	1.083
1997	5.030	4.926
1998	2.207	0.817
1999	1.080	0.892
2000	2.682	0.988
2001	0.520	0.656
2002	0.995	0.902

2003	0.758	0.792
2004	2.588	1.156
2005	1.064	0.906
2006	3.944	1.155
2007	3.256	0.890
2008	2.500	2.945
2009	1.279	0.855

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	7.6489	4.9259
2	7.3025	2.9447
3	6.0422	2.4211
4	5.6460	1.2176
5	5.0296	1.1558
6	4.4019	1.1550
7	4.1757	1.1434
8	3.9439	1.0841
9	3.6519	1.0834
10	3.3094	1.0741
11	3.2556	1.0588
12	2.9185	1.0560
13	2.8005	1.0552
14	2.7625	1.0183
15	2.7392	1.0115
16	2.7127	1.0078
17	2.7024	1.0018
18	2.6821	1.0006
19	2.6660	0.9875
20	2.5880	0.9739
21	2.4999	0.9664
22	2.4246	0.9619
23	2.3844	0.9495
24	2.3488	0.9425
25	2.2626	0.9168
26	2.2445	0.9083
27	2.2073	0.9064
28	2.1643	0.9062
29	2.1514	0.9032
30	2.0909	0.9024
31	2.0398	0.8918
32	1.9896	0.8896
33	1.9602	0.8890
34	1.9271	0.8849
35	1.8853	0.8842
36	1.8044	0.8778
37	1.6845	0.8705
38	1.6820	0.8688
39	1.6709	0.8636
40	1.6621	0.8597
41	1.5560	0.8546
42	1.5240	0.8440
43	1.3789	0.8404
44	1.3694	0.8182
45	1.3171	0.8170

46	1.2847	0.8169
47	1.2828	0.8135
48	1.2789	0.8070
49	1.2664	0.8020
50	1.1495	0.7922
51	1.1460	0.7921
52	1.0912	0.7899
53	1.0801	0.7827
54	1.0640	0.7567
55	1.0347	0.7521
56	0.9955	0.7493
57	0.9385	0.7033
58	0.9232	0.6989
59	0.8883	0.6982
60	0.7577	0.6750
61	0.5196	0.6560

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.9848	1822	1775	97	Pass
1.0431	1484	1330	89	Pass
1.1015	1263	968	76	Pass
1.1598	1084	745	68	Pass
1.2182	948	624	65	Pass
1.2765	843	560	66	Pass
1.3348	757	470	62	Pass
1.3932	688	374	54	Pass
1.4515	625	259	41	Pass
1.5099	566	184	32	Pass
1.5682	527	172	32	Pass
1.6266	480	159	33	Pass
1.6849	443	154	34	Pass
1.7433	412	150	36	Pass
1.8016	379	146	38	Pass
1.8600	341	139	40	Pass
1.9183	310	135	43	Pass
1.9767	279	125	44	Pass
2.0350	248	123	49	Pass
2.0933	213	119	55	Pass
2.1517	183	111	60	Pass
2.2100	157	101	64	Pass
2.2684	132	95	71	Pass
2.3267	114	91	79	Pass
2.3851	97	79	81	Pass
2.4434	80	63	78	Pass
2.5018	71	58	81	Pass
2.5601	62	52	83	Pass
2.6185	55	37	67	Pass
2.6768	50	34	68	Pass
2.7352	43	30	69	Pass
2.7935	38	30	78	Pass

2.8519	33	28	84	Pass
2.9102	30	25	83	Pass
2.9685	28	23	82	Pass
3.0269	26	22	84	Pass
3.0852	25	21	84	Pass
3.1436	23	20	86	Pass
3.2019	23	19	82	Pass
3.2603	21	18	85	Pass
3.3186	17	18	105	Pass
3.3770	16	17	106	Pass
3.4353	15	16	106	Pass
3.4937	15	16	106	Pass
3.5520	14	14	100	Pass
3.6104	13	13	100	Pass
3.6687	12	12	100	Pass
3.7270	12	11	91	Pass
3.7854	11	11	100	Pass
3.8437	11	11	100	Pass
3.9021	11	11	100	Pass
3.9604	10	10	100	Pass
4.0188	10	10	100	Pass
4.0771	10	9	90	Pass
4.1355	9	8	88	Pass
4.1938	8	8	100	Pass
4.2522	8	7	87	Pass
4.3105	8	6	75	Pass
4.3689	8	5	62	Pass
4.4272	6	5	83	Pass
4.4856	6	5	83	Pass
4.5439	6	5	83	Pass
4.6022	6	5	83	Pass
4.6606	6	4	66	Pass
4.7189	6	2	33	Pass
4.7773	6	2	33	Pass
4.8356	6	1	16	Pass
4.8940	6	1	16	Pass
4.9523	6	0	0	Pass
5.0107	6	0	0	Pass
5.0690	5	0	0	Pass
5.1274	5	0	0	Pass
5.1857	5	0	0	Pass
5.2441	5	0	0	Pass
5.3024	5	0	0	Pass
5.3607	5	0	0	Pass
5.4191	5	0	0	Pass
5.4774	5	0	0	Pass
5.5358	5	0	0	Pass
5.5941	5	0	0	Pass
5.6525	4	0	0	Pass
5.7108	4	0	0	Pass
5.7692	4	0	0	Pass
5.8275	4	0	0	Pass
5.8859	4	0	0	Pass
5.9442	4	0	0	Pass
6.0026	4	0	0	Pass
6.0609	3	0	0	Pass
6.1193	3	0	0	Pass

6.1776	3	0	0	Pass
6.2359	3	0	0	Pass
6.2943	3	0	0	Pass
6.3526	3	0	0	Pass
6.4110	3	0	0	Pass
6.4693	3	0	0	Pass
6.5277	3	0	0	Pass
6.5860	3	0	0	Pass
6.6444	3	0	0	Pass
6.7027	3	0	0	Pass
6.7611	3	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 1.1521 **acre-feet**
On-line facility target flow: 1.5661 **cfs.**
Adjusted for 15 min: 1.5661 **cfs.**
Off-line facility target flow: 0.8834 **cfs.**
Adjusted for 15 min: 0.8834 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volumn Needs Treatment (ac-ft)	Volumn Through Facility (ac-ft)	Infiltration Volumn (ac-ft.)	Cumulative Volumn Infiltration Credit	Percent Volumn Infiltrated	Comment Water Quality Treated
Pond POC	N	3777.09			N	0.00	
Trapezoidal Pond 1	N	1336.75			N	0.00	
Total Volume Infiltrated		5113.83	0.00	0.00		0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes

No changes have been made.

North Detention Pond

WWHM2012

PROJECT REPORT

Project Name: 17841-Eaglemont 4-Prelim Sizing-3ori-2of2
Site Name: Eaglemont 4
Site Address: 13511 191ST AVE SE
City : Monroe
Report Date: 6/6/2016
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2016/02/25
Version : 4.2.12

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	15.03
C, Lawn, Mod	.81
Pervious Total	15.84

Impervious Land Use	acre
ROOF TOPS FLAT	0.2
Impervious Total	0.2
Basin Total	16.04

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	4.28
C, Lawn, Mod	4.01
Pervious Total	8.29

Impervious Land Use	acre
ROADS FLAT	1.86
ROADS MOD	0.88
ROOF TOPS FLAT	4.36
POND	0.65
Impervious Total	7.75
Basin Total	16.04

Element Flows To:

Surface	Interflow	Groundwater
Pond	Pond	

North Detention Vault

Name : Pond
Width : 144 ft.
Length : 145 ft.
Depth: 11.75 ft.

Require Volume = 223,550 CF

Discharge Structure
Riser Height: 10.75 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.84 in. **Elevation:** 0 ft.
Orifice 2 Diameter: 4.3 in. **Elevation:** 7.30025 ft.
Orifice 3 Diameter: 2.63 in. **Elevation:** 8.1925 ft.

Element Flows To:

Outlet 1	Outlet 2

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.479	0.000	0.000	0.000
0.1306	0.479	0.062	0.033	0.000
0.2611	0.479	0.125	0.046	0.000
0.3917	0.479	0.187	0.057	0.000
0.5222	0.479	0.250	0.066	0.000
0.6528	0.479	0.312	0.074	0.000
0.7833	0.479	0.375	0.081	0.000
0.9139	0.479	0.438	0.087	0.000
1.0444	0.479	0.500	0.093	0.000
1.1750	0.479	0.563	0.099	0.000

1.3056	0.479	0.625	0.105	0.000
1.4361	0.479	0.688	0.110	0.000
1.5667	0.479	0.751	0.115	0.000
1.6972	0.479	0.813	0.119	0.000
1.8278	0.479	0.876	0.124	0.000
1.9583	0.479	0.938	0.128	0.000
2.0889	0.479	1.001	0.132	0.000
2.2194	0.479	1.063	0.136	0.000
2.3500	0.479	1.126	0.140	0.000
2.4806	0.479	1.189	0.144	0.000
2.6111	0.479	1.251	0.148	0.000
2.7417	0.479	1.314	0.152	0.000
2.8722	0.479	1.376	0.155	0.000
3.0028	0.479	1.439	0.159	0.000
3.1333	0.479	1.501	0.162	0.000
3.2639	0.479	1.564	0.166	0.000
3.3944	0.479	1.627	0.169	0.000
3.5250	0.479	1.689	0.172	0.000
3.6556	0.479	1.752	0.175	0.000
3.7861	0.479	1.814	0.178	0.000
3.9167	0.479	1.877	0.181	0.000
4.0472	0.479	1.940	0.184	0.000
4.1778	0.479	2.002	0.187	0.000
4.3083	0.479	2.065	0.190	0.000
4.4389	0.479	2.127	0.193	0.000
4.5694	0.479	2.190	0.196	0.000
4.7000	0.479	2.252	0.199	0.000
4.8306	0.479	2.315	0.201	0.000
4.9611	0.479	2.378	0.204	0.000
5.0917	0.479	2.440	0.207	0.000
5.2222	0.479	2.503	0.210	0.000
5.3528	0.479	2.565	0.212	0.000
5.4833	0.479	2.628	0.215	0.000
5.6139	0.479	2.691	0.217	0.000
5.7444	0.479	2.753	0.220	0.000
5.8750	0.479	2.816	0.222	0.000
6.0056	0.479	2.878	0.225	0.000
6.1361	0.479	2.941	0.227	0.000
6.2667	0.479	3.003	0.230	0.000
6.3972	0.479	3.066	0.232	0.000
6.5278	0.479	3.129	0.234	0.000
6.6583	0.479	3.191	0.237	0.000
6.7889	0.479	3.254	0.239	0.000
6.9194	0.479	3.316	0.241	0.000
7.0500	0.479	3.379	0.243	0.000
7.1806	0.479	3.441	0.246	0.000
7.3111	0.479	3.504	0.300	0.000
7.4417	0.479	3.567	0.439	0.000
7.5722	0.479	3.629	0.514	0.000
7.7028	0.479	3.692	0.573	0.000
7.8333	0.479	3.754	0.623	0.000
7.9639	0.479	3.817	0.668	0.000
8.0944	0.479	3.880	0.708	0.000
8.2250	0.479	3.942	0.779	0.000
8.3556	0.479	4.005	0.856	0.000
8.4861	0.479	4.067	0.915	0.000
8.6167	0.479	4.130	0.967	0.000

8.7472	0.479	4.192	1.015	0.000
8.8778	0.479	4.255	1.059	0.000
9.0083	0.479	4.318	1.101	0.000
9.1389	0.479	4.380	1.140	0.000
9.2694	0.479	4.443	1.178	0.000
9.4000	0.479	4.505	1.215	0.000
9.5306	0.479	4.568	1.250	0.000
9.6611	0.479	4.630	1.284	0.000
9.7917	0.479	4.693	1.316	0.000
9.9222	0.479	4.756	1.348	0.000
10.053	0.479	4.818	1.379	0.000
10.183	0.479	4.881	1.410	0.000
10.314	0.479	4.943	1.439	0.000
10.444	0.479	5.006	1.468	0.000
10.575	0.479	5.069	1.496	0.000
10.706	0.479	5.131	1.524	0.000
10.836	0.479	5.194	1.952	0.000
10.967	0.479	5.256	3.155	0.000
11.097	0.479	5.319	4.644	0.000
11.228	0.479	5.381	6.062	0.000
11.358	0.479	5.444	7.106	0.000
11.489	0.479	5.507	7.712	0.000
11.619	0.479	5.569	8.311	0.000
11.750	0.479	5.632	8.814	0.000
11.881	0.974	10.83	9.286	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:15.84
Total Impervious Area:0.2

Mitigated Landuse Totals for POC #1
Total Pervious Area:8.29
Total Impervious Area:7.75

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.736998
5 year	1.201045
10 year	1.575569
25 year	2.130862
50 year	2.607755
100 year	3.141959

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.275957

5 year	0.473955
10 year	0.655434
25 year	0.956869
50 year	1.24446
100 year	1.596211

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.950	0.198
1950	1.000	0.239
1951	0.700	0.196
1952	0.679	0.192
1953	0.651	0.188
1954	2.740	0.217
1955	0.959	0.645
1956	0.699	0.695
1957	1.074	0.268
1958	1.557	0.217
1959	0.658	0.225
1960	0.831	0.232
1961	2.223	0.585
1962	0.763	0.180
1963	1.337	0.210
1964	0.910	0.163
1965	0.493	0.233
1966	0.325	0.196
1967	0.653	0.202
1968	0.834	0.236
1969	2.868	0.214
1970	0.474	0.203
1971	0.937	0.736
1972	0.687	0.210
1973	0.536	0.242
1974	1.440	0.229
1975	0.762	0.176
1976	0.558	0.221
1977	0.430	0.187
1978	0.490	0.188
1979	1.700	0.191
1980	0.790	0.192
1981	0.509	0.185
1982	0.572	0.492
1983	1.265	0.210
1984	0.558	0.878
1985	0.819	0.602
1986	1.869	1.204
1987	0.750	0.988
1988	0.467	0.316
1989	0.714	0.182
1990	0.524	0.243
1991	0.569	0.232
1992	0.607	0.240
1993	0.459	0.159
1994	0.389	0.240
1995	0.546	0.506

1996	1.203	0.399
1997	2.292	2.115
1998	0.492	0.206
1999	0.449	0.233
2000	0.491	0.581
2001	0.155	0.140
2002	0.516	0.379
2003	0.400	0.217
2004	0.667	0.456
2005	0.488	0.219
2006	1.800	0.627
2007	1.391	0.469
2008	1.371	1.073
2009	0.420	0.236

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	2.8684	2.1146
2	2.7397	1.2041
3	2.2925	1.0733
4	2.2232	0.9882
5	1.8694	0.8778
6	1.7997	0.7365
7	1.7004	0.6945
8	1.5574	0.6448
9	1.4400	0.6269
10	1.3914	0.6018
11	1.3705	0.5851
12	1.3372	0.5814
13	1.2648	0.5056
14	1.2027	0.4925
15	1.0741	0.4692
16	1.0001	0.4561
17	0.9594	0.3988
18	0.9499	0.3793
19	0.9372	0.3160
20	0.9104	0.2682
21	0.8344	0.2427
22	0.8307	0.2416
23	0.8185	0.2401
24	0.7900	0.2398
25	0.7634	0.2391
26	0.7619	0.2364
27	0.7505	0.2355
28	0.7142	0.2335
29	0.6998	0.2334
30	0.6993	0.2320
31	0.6871	0.2320
32	0.6787	0.2290
33	0.6672	0.2248
34	0.6577	0.2212
35	0.6535	0.2194
36	0.6510	0.2174
37	0.6074	0.2173
38	0.5716	0.2172

39	0.5686	0.2136
40	0.5585	0.2105
41	0.5576	0.2098
42	0.5458	0.2096
43	0.5365	0.2064
44	0.5242	0.2027
45	0.5159	0.2019
46	0.5090	0.1977
47	0.4930	0.1957
48	0.4917	0.1955
49	0.4913	0.1923
50	0.4895	0.1920
51	0.4881	0.1905
52	0.4737	0.1882
53	0.4667	0.1882
54	0.4594	0.1871
55	0.4492	0.1850
56	0.4295	0.1823
57	0.4197	0.1801
58	0.4003	0.1764
59	0.3888	0.1631
60	0.3253	0.1585
61	0.1553	0.1399

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3685	7852	2462	31	Pass
0.3911	6228	2286	36	Pass
0.4137	5056	2141	42	Pass
0.4364	4092	2004	48	Pass
0.4590	3332	1813	54	Pass
0.4816	2710	1638	60	Pass
0.5042	2229	1485	66	Pass
0.5268	1845	1347	73	Pass
0.5494	1541	1221	79	Pass
0.5721	1331	1104	82	Pass
0.5947	1176	979	83	Pass
0.6173	1058	891	84	Pass
0.6399	957	805	84	Pass
0.6625	862	746	86	Pass
0.6852	784	682	86	Pass
0.7078	712	602	84	Pass
0.7304	658	559	84	Pass
0.7530	618	521	84	Pass
0.7756	584	495	84	Pass
0.7983	547	462	84	Pass
0.8209	517	442	85	Pass
0.8435	479	423	88	Pass
0.8661	446	397	89	Pass
0.8887	426	370	86	Pass
0.9113	397	354	89	Pass

0.9340	377	336	89	Pass
0.9566	357	314	87	Pass
0.9792	341	286	83	Pass
1.0018	324	267	82	Pass
1.0244	313	255	81	Pass
1.0471	296	234	79	Pass
1.0697	277	192	69	Pass
1.0923	255	165	64	Pass
1.1149	242	158	65	Pass
1.1375	226	147	65	Pass
1.1602	210	139	66	Pass
1.1828	190	130	68	Pass
1.2054	172	117	68	Pass
1.2280	160	113	70	Pass
1.2506	145	109	75	Pass
1.2732	132	104	78	Pass
1.2959	115	100	86	Pass
1.3185	92	95	103	Pass
1.3411	76	78	102	Pass
1.3637	68	63	92	Pass
1.3863	57	59	103	Pass
1.4090	50	53	105	Pass
1.4316	46	48	104	Pass
1.4542	41	43	104	Pass
1.4768	33	32	96	Pass
1.4994	27	25	92	Pass
1.5221	24	19	79	Pass
1.5447	20	15	75	Pass
1.5673	17	12	70	Pass
1.5899	14	11	78	Pass
1.6125	13	10	76	Pass
1.6351	13	10	76	Pass
1.6578	13	10	76	Pass
1.6804	13	9	69	Pass
1.7030	10	8	80	Pass
1.7256	9	8	88	Pass
1.7482	8	8	100	Pass
1.7709	8	8	100	Pass
1.7935	8	6	75	Pass
1.8161	7	6	85	Pass
1.8387	7	6	85	Pass
1.8613	7	6	85	Pass
1.8840	6	5	83	Pass
1.9066	6	4	66	Pass
1.9292	6	4	66	Pass
1.9518	6	3	50	Pass
1.9744	6	3	50	Pass
1.9970	6	3	50	Pass
2.0197	5	3	60	Pass
2.0423	5	2	40	Pass
2.0649	5	1	20	Pass
2.0875	5	1	20	Pass
2.1101	4	1	25	Pass
2.1328	4	0	0	Pass
2.1554	4	0	0	Pass
2.1780	4	0	0	Pass
2.2006	4	0	0	Pass

2.2232	4	0	0	Pass
2.2459	3	0	0	Pass
2.2685	3	0	0	Pass
2.2911	3	0	0	Pass
2.3137	2	0	0	Pass
2.3363	2	0	0	Pass
2.3589	2	0	0	Pass
2.3816	2	0	0	Pass
2.4042	2	0	0	Pass
2.4268	2	0	0	Pass
2.4494	2	0	0	Pass
2.4720	2	0	0	Pass
2.4947	2	0	0	Pass
2.5173	2	0	0	Pass
2.5399	2	0	0	Pass
2.5625	2	0	0	Pass
2.5851	2	0	0	Pass
2.6078	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 1.2058 **acre-feet**
On-line facility target flow: 1.4516 **cfs.**
Adjusted for 15 min: 1.4516 **cfs.**
Off-line facility target flow: 0.8148 **cfs.**
Adjusted for 15 min: 0.8148 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volumn Percent Needs Treatment (ac-ft)	Volumn Through Facility (ac-ft)	Infiltration Volumn (ac-ft.)	Cumulative Volumn Infiltration Credit	Comment
Pond POC	N	2182.70			N	
Percent Volumn Infiltrated: 0.00	Water Quality Treated: 0%					
Total Volume Infiltrated		2182.70	0.00	0.00	0.00	
0.00	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes

No changes have been made.

Tab 8.0

SECTION 8 - WETLANDS PROTECTION

The site contains one small wetland area located the northwest corner of the site. The wetland is to be preserved within its own designated tract (Tract 994). This project will avoid disturbance within the wetland and provides mitigation for impacts within the buffer. No onsite areas are tributary to the wetland area, so no runoff is expected to be diverted away.

Tab 9.0

SECTION 9 - BASIN/WATERSHED PLANNING

There are no adopted basin/watershed plans applicable to this project.

Tab 10.0

SECTION 10 - OPERATIONS AND MAINTENANCE

Stormwater facilities and BMPs shall be inspected, operated and maintained in accordance with Sections 30.63A.575 through 30.63A.605 of Snohomish County Code. Additional maintenance recommendations can be found in Volume V, Section 4 of the Snohomish County Stormwater Manual, including the recommendations contained on the following pages:

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Function of facility is impaired by or likely to be impaired by trash and debris.	Trash and debris is removed.
	Vegetation	Function of facility is impaired by vegetation.	Vegetation is removed or managed to restore proper function of facility. Use of herbicides shall be in accordance with applicable regulations.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants Note: Coordinate removal/cleanup with local and/or state water quality response agency.	Contaminants or pollutants are removed
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. Note: Contact Snohomish County Surface Water Management if removal of beavers is contemplated.
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects are destroyed or removed from site. Use of pesticides shall be in accordance with applicable regulations
	Tree Growth and Hazard Trees	Function of facility is impaired by trees. Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove Hazard trees (i.e., dead, diseased, or dying trees) need to be identified Note: A certified Arborist may be needed to determine health of trees or removal requirements.	Trees are removed or managed to restore proper function of facility. Trees do not hinder maintenance activities. Hazard trees are identified and those that pose an imminent danger are removed.
	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes are stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.
General	Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner is repaired or replaced. Liner is fully covered.
Berms	Settling	Any part of a berm which has settled at least 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. Note: A licensed civil engineer may be needed to determine the cause of the settlement.	Berm is repaired and restored to the design elevation.

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Erosion	Any erosion observed on a compacted structural berm embankment. Note: A licensed civil engineer may be needed to inspect, evaluate and recommend a repair plan.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.
	Piping	Discernable water flow through a compacted structural berm. Ongoing erosion with potential for erosion to continue. Tree growth on a compacted structural berm over 4 feet in height may lead to piping through the berm which could lead to failure of the berm. Evidence of rodent holes in berm, and/or water piping through berm via rodent holes Note: A geotechnical engineer may be needed to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
Emergency Overflow/ Spillway	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. Note: A licensed civil engineer may be needed to determine proper berm/spillway restoration.
	Rock Armoring	Rock layer on subgrade is less than 1.0 feet deep and/or subgrade is exposed	Rocks and pad depth are restored to a minimum depth of 1.0 feet.
	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes are stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.

No. 4 – Control Structure/Flow Restrictors

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Standpipe	Obstructions	Any material blocking (or having the potential of blocking) the pipe overflow.	Pipe is free of all obstructions and works as designed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure is securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure is in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes other than designed holes in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Access Hole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Locking mechanism cannot be opened or lock bolts cannot be removed by one maintenance person with proper hand tools.	Mechanism or lock bolts open with proper hand tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, cracked/broken rungs, misalignment, rungs not securely attached to structure wall, rust, or cracks.	Ladder meets design standards and allows maintenance person safe access.

No. 4 – Control Structure/Flow Restrictors

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Catch Basin	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).
	Sediment & Debris	Sediment, trash, vegetation, and/or other debris material exceeds 25% of the catch basin sump depth or is 1 foot below the orifice plate.	Control structure orifice is not blocked. All sediment and debris removed.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Sediment & Debris	Sediment, trash, and/or other debris material is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No sediment or debris is located immediately in front of catch basin or on grate opening.
		Sediment, trash, and/or other debris material (located in the catch basin) exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No sediment or debris is in the catch basin.
		Sediment, trash, and/or other debris material located in any inlet or outlet pipe is blocking more than 1/3 of its height.	Inlet and outlet pipes are free of sediment and debris.
		Dead animals or vegetation that impair catch basin function or that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation are present within the catch basin.
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is seeping into the catch basin).	Top slab is free of holes and cracks. No water and/or soil is seeping into the catch basin
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks, or qualified maintenance or inspection personnel determine that the vault is not structurally sound.	Catch basin is replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	Settlement of misalignment of the catch basin causes a safety, function, or design problem.	Catch basin is replaced or repaired to design standards.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants Note: Coordinate removal/cleanup with local and/or state water quality response agency.	Contaminants or pollutants are removed.
Access Hole Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is fully in place
	Locking Mechanism Not Working	Locking mechanism cannot be opened or lock bolts cannot be removed by one maintenance person with proper hand tools.	Mechanism or lock bolts open with proper hand tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools. Intent is keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, cracked/broken rungs, rungs not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

No. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Sediment & Debris	Sediment, trash, and/or other debris material is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No sediment or debris is located immediately in front of catch basin or on grate opening.
		Sediment, trash, and/or other debris material (located in the catch basin) exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No sediment or debris is in the catch basin.
		Sediment, trash, and/or other debris material located in any inlet or outlet pipe is blocking more than 1/3 of its height.	Inlet and outlet pipes are free of sediment and debris.
		Dead animals or vegetation that impair catch basin function or that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation are present within the catch basin.
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is seeping into the catch basin).	Top slab is free of holes and cracks. No water and/or soil is seeping into the catch basin
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks, or qualified maintenance or inspection personnel determine that the vault is not structurally sound.	Catch basin is replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	Settlement of misalignment of the catch basin causes a safety, function, or design problem.	Catch basin is replaced or repaired to design standards.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants Note: Coordinate removal/cleanup with local and/or state water quality response agency.	Contaminants or pollutants are removed.
Access Hole Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is fully in place
	Locking Mechanism Not Working	Locking mechanism cannot be opened or lock bolts cannot be removed by one maintenance person with proper hand tools.	Mechanism or lock bolts open with proper hand tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools. Intent is keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, cracked/broken rungs, rungs not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

No. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

No. 15 – Stormfilter™

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault	Sediment Accumulation on Media.	Sediment depth exceeds 1/4 inch.	No sediment deposits which would impede permeability of the compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6 inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment/Debris in Drain Pipes/Cleanouts	Sediment, trash, and/or other debris material located in any inlet, outlet, or cleanout pipe is blocking more than 1/3 of its height.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Hole Cover Damaged/Not Working	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks, or qualified maintenance or inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4 inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by qualified maintenance or inspection personnel.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, has cracked/broken rungs, and/or is misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media clogged	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Flow short Circuited	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Check manufacturer's operation and maintenance manual for complete maintenance instructions.

No. 21 - Conveyance Storm Pipes

Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Obstructions, Including Roots	Root enters or deforms pipe, reducing flow.	Use mechanical methods to remove root if possible. Use of chemicals to remove roots shall be done in accordance with applicable regulations. If necessary, remove the vegetation over the line.
	Pipe Dented or Broken	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Pipe Rusted or Deteriorated	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired and/or replaced.
	Sediment & Debris	Sediment depth is greater than 20% of pipe diameter.	Install upstream debris traps (where applicable) then clean pipe and remove material.
	Debris barrier or Trash Rack Missing	A debris barrier or trash rack that had been installed on the end of a drainage pipe is missing	Debris barrier or trash rack is replaced.
	Joint/Seal Problems	The joint between pipe sections is separated and/or the seal at the joint is cracked or broken.	The joint and/or seal is repaired so that joint is not separated and is properly sealed.

No. 23 – Access Gates

Maintenance Component	Defect	Condition When Maintenance is Needed	Maintenance Action and Expected Results
General	Damaged or missing components	Gate and/or locking mechanism condition is such that access is impeded.	Gate and locking mechanism are fully functional for access purposes.
	Damaged or missing components	Broken or missing hinges such that gate cannot be easily opened and closed by a maintenance person.	Hinges intact and lubed. Gate is working freely.
	Damaged or missing components	Gate is out of plumb more than 6 inches and more than 1 foot out of design alignment.	Gate is aligned and vertical (plumb).
	Damaged or missing components	Missing stretcher bands, and ties.	Stretcher bar, bands, and ties in place.

No. 24 – Access Roads

Maintenance Component	Defect	Condition When Maintenance is Needed	Maintenance Action and Expected Results
General	Road Surface	Condition of road surface may lead to erosion of the facility or limit access.	Road repaired.
	Erosion of Ground Surface	Noticeable rills are seen in landscaped areas.	Causes of erosion are identified and steps taken to slow down/spread out the water. Eroded areas are filled, contoured, and seeded. If needed, regrade affected areas.
	Vegetation	Function of road is impaired by vegetation	Vegetation is removed or managed to restore proper function of facility. Use of herbicides shall be in accordance with applicable regulations.
	Tree Growth	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove.	Trees do not hinder maintenance activities.
		Trees or shrubs that have fallen over road.	Fallen trees or shrubs removed from road.